U.S. DEPARTMENT OF DEFENSE

DIRECTORY PROTECTION PROFILE

FOR

MEDIUM ROBUSTNESS ENVIRONMENTS

VERSION 2.0

9 APRIL 2003

FOR REVIEW PROCESS ONLY[1]

Review Process

Please submit comments to Don Willhelm within 2.5 weeks of receiving the document.
Please look carefully at the information that is relevant to your area of interest and expertise. Your input during this review process and comments on this draft are critical to ensure a useful and high quality document.
Please refer to a section number and/or specific paragraph number when submitting comments to reduce confusion.
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To expedite the review process, and to facilitate a clear understanding of the issues, please call the primary contact with any questions:

- Primary contact – Don Willhelm; National Security Agency, V52; phone: 410-854-7254; email: dwwillh@missi.ncsc.mil.
- Author – Shari Galitzer; Entrust CygnaCom; phone: 608-251-6414; email: shari.galitzer@entrust.com.
- Source requirements and program application support – A&N Associates; phone: 410-772-5060; Matt Hirsch; ext. 22; email: mhirsch@anassoc; Alethea Brown; ext. 19; email: abrown@anassoc.com.

Revisions

This document replaces the 'Department of Defense Class 4 PKI Directory Protection Profile', version 1.0, 27 November 2001, and includes modifications for the following purposes:

- To be consistent with the 'Protection Profile Consistency Guidance', 23 July 2002 for medium robustness, and guidance from the PP Review Board.
- To provide a more generalized set of security requirements for a Medium Assurance PKI directory.
- To remove functional requirements that belong in a program's system requirements specification, but not in the PP.
- To incorporate general edits/improvements to the document based on further review and comments received.

ACKNOWLEDGEMENTS

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[1] This section is included for the review process and will be removed when the document is final.

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1   INTRODUCTION

This Directory Protection Profile (PP) for Medium Robustness Environments was generated by the National Security Agency (NSA) for Department of Defense (DoD) PKI Systems and is intended for the following uses:

- For product vendors and security product evaluators, this PP defines the requirements that must be addressed by specific products as documented in vendor Security Targets (STs).
- For system integrators, this PP is useful in identifying areas that need to be addressed to provide secure system solutions. By matching the PP with available STs, security gaps may be identified and products or procedures may be configured to bridge these gaps.

1.1   IDENTIFICATION

Title: U.S. Department of Defense (DoD) Directory Protection Profile (PP) for Medium Robustness Environments
Sponsor: National Security Agency (NSA)
CC Version: Common Criteria (CC) Version 2.1, and applicable interpretations.
Registration: <to be provided upon registration>
Protection Profile Version: Version 2.0, dated 9 April 2003.
Evaluation Assurance Level: EAL4 augmented with ALC_FLR.2, AVA_VLA.3, AMA_AMP.1, AMA_CAT.1, AMA_EVD.1, ADV_IMP.2, ADV_INT.1, AET_DPT.2, AVA_CCA_EXP.2, and AMA_SIA.1.
Keywords: Directory, X.509, Repository, Replication, Chaining, Medium Robustness Environments, Public Key Infrastructure (PKI), Global Directory Service (GDS), Key Management Infrastructure (KMI), Department of Defense (DoD), Directory System Agent (DSA), Administrative Directory User agent (ADUA).

1.2   PROTECTION PROFILE OVERVIEW

This PP specifies the minimum-security requirements for directories (i.e., the Target of Evaluation (TOE)) used by the Department of Defense (DoD) in Medium Robustness Environments.   The directory provides controlled access to a repository of information for a single classification or marking, and is considered sufficient protection for environments where the likelihood of an attempted compromise is medium. The target robustness level of "medium" is specified in the Guidance and Policy for the Department of Defense Global Information Grid Information Assurance (GIG) [2] and is further discussed in Section 3.0 of this PP.

STs claiming compliance may consist of one or more devices, and, as a medium robustness TOE, must define its TOE to include all the components necessary to meet the security functional requirements, including the hardware. The PP defines the requirements for a directory that may or may not be a single directory server, but that must be able to function as part of a distributed directory system. A distributed directory

system comprises multiple individual directory servers that interoperate using chaining and replication to form an overall distributed directory. Distributed directory systems are often required to support PKIs and other mission critical applications and systems.

This PP includes requirements for general-purpose directories and their application in Public Key Infrastructure (PKIs), including the Class 4 Department of Defense (DoD) PKI and its associated X.509 Certificate Policy, the Key Management Infrastructure (KMI), and the Global Directory Service (GDS). The directory is the PKI component that makes certificates and revocation lists available for relying parties to read, and allows authorized trusted users and IT entities access (e.g., Certificate Authorities (CAs) and other trusted directories) to update and maintain this information. The directory must also securely interoperate with the system components that analyze and manage system-wide audit data, and synchronize time among the system components.

A specific directory protocol is not specified. However, as a directory capable of operating within a distributed directory system, a TOE claiming conformance to this PP must support some industry standards to ensure consistent enforcement of a security policy. This includes support for the X.500 directory information model and the chaining, replication and access control requirements specified in Section 5.1.

The TOE includes security requirements for identification and authentication (I&A), access control, non-repudiation, audit, trusted channel/path, and TSF management, self-protection, and data availability. The TOE includes a cryptographic module for the security mechanisms that use encryption and digital signatures.

This PP defines:
- assumptions about the security aspects of the environment in which the TOE will be used;
- threats that are to be addressed by the TOE;
- security objectives of the TOE and its environment;
- functional and assurance requirements to meet those security objectives; and
- rationale demonstrating how the requirements meet the security objectives, and how the security objectives address the threats.

1.3 COMMON CRITERIA CONFORMANCE

This Protection Profile is Part 2 Conformant and Part 3 Conformant, with assurance requirements of EAL4 augmented with ALC_FLR.2, AVA_VLA.3, AMA_AMP.1, AMA_CAT.1, AMA_EVD.1, ADV_IMP.2, ADV_INT.1, AET_DPT.2, AVA_CCA_EXP.2, and AMA_SIA.1.

STs claiming conformance to this PP must define its TOE to include all SFRs specified in Section 5.1 without reliance to its environment, and all components required for operation, including hardware components.

1.4 PROTECTION PROFILE ORGANIZATION

Section 1 introduces this PP document through an overview, a statement of Common Criteria Conformance, and a description of this PP organization.

Section 2 describes the TOE and the environment. This section also provides an overview of the security functionality provided upon conformance with this PP.

Section 3 provides informative introductory text to help the reader gain an understanding of the various robustness levels and more importantly how to determine the proper robustness level for a given system. Additionally, Section 3 discusses the characteristics of environments and threat levels appropriate for the TOE and specifies the TOE assumptions, threats, and organizational security policies.

Section 4 identifies the security objectives satisfied by the TOE and the TOE environment.

Section 5 specifies the functional and assurance requirements for the TOE and its IT environment.

Section 6 provides the rationale for the security objectives and the security requirements. The objectives rationale shows that the security objectives address the assumptions, threats and policies. The requirements rationale shows that the requirements meet the objectives and that all dependencies are satisfied. In addition, rationale is provided for the Strength of Function (SOF) and Assurance requirements.

Section 7 contains expansions of acronyms used throughout this PP.

Section 8 contains the references.

Section 9 provides a glossary of terms.

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2   TOE DESCRIPTION

2.1   PRODUCT TYPE

TOEs claiming conformance to this Protection Profile are directories that provide controlled access to a repository of information requiring protection at a Medium Level of Assurance at a single classification or marking. The security requirements specified here include directory security services required to support Public Key Infrastructure (PKI) systems including, but not limited to the Class 4 Department of Defense (DoD) PKI, the Key Management Infrastructure (KMI) and the Global Directory Service (GDS).

The Directory is the component in a PKI that makes certificates and revocation lists available for relying parties to read, and allows trusted users and trusted IT entities (e.g., CAs) update access to maintain this information. Other non-PKI data such as location and phone numbers may also be stored in a Directory along with the PKI data. As a component in the PKI system the Directory must also support system-wide security services. This includes supporting access to its audit data for system-wide audit data analysis, and mechanisms to ensure the directory's time is synchronized with the PKI system.

Distributed directory systems are often required to support PKIs and other mission critical applications and systems. A distributed directory system comprises multiple individual directory servers that interoperate to form an overall distributed directory that receives its data from various sources, protects it in accordance with the system security policy, and makes it available in accordance with the system security policy. This PP defines the requirements for a Directory which may or may not be a single directory server, but which must be able to function as part of a Distributed Directory System.

Directories can be implemented in various ways and may use several different components and technologies as part of a system. Some of these components have existing PP's, e.g., Certificate Issuing and Management Components (CIMC), and there are also PP's for technologies that may be used to implement a Directory system, e.g., a web server.   The PP's that may be applicable for a system implementation are listed in Section 8.3, Related Protection Profiles. Users that want an evaluation of a directory that includes these other components are to specify that they expect all applicable PPs to be compliant in their acquisition request.

A specific directory protocol is not specified. However, as a directory capable of operating within a distributed directory system a TOE claiming conformance to this PP must support some industry standards to ensure consistent enforcement of a security policy. This includes support for the X.500 directory information model and the chaining, replication and access control requirements specified in Section 5.1. The PP also requires that all hardware and software components necessary to construct a complete TOE are included in the TOE for any ST claiming conformance.

The TOE functional security requirements, i.e., security services, can be categorized as follows, and are described in Section 2.4:

- Access Control,
- Identification and Authentication,
- Replication,
- Non-repudiation,
- Audit,
- Trusted Channel/Path,
- Cryptographic Support,
- Administration,
- Internal Capabilities

The following provides more information on the components of the TOE, its users, and the security services.

2.2 TOE BOUNDARY

The TOE boundary, illustrated in Figure 2.1 below, includes all hardware and software components necessary to provide secure directory service. The TOE includes functionality required to administer and manage the directory both locally and remotely. The interface for trusted remote access is not included in the TOE to enable applications to use interfaces appropriate for their system architecture. The TOE does require the remote trusted interfaces establish a trusted channel with the TOE and a trusted path with its users, and that the users authenticate to the TOE.

While this document does not dictate the required components, Figure 2.2 provides an example implementation that includes:

- The Directory Service application, e.g., DSA,
- The Directory Information Base, i.e., the data repository,
- Administrative functionality, e.g., ADUA,
- A Cryptographic Module,
- An Operational Platform that provides data storage, network interface and includes an operating system and a hardware platform.

Figure 2.3 provides an illustration of the TOE as a component in a distributed directory system and the security functions directly related to distributed operations, i.e., replication, chaining, non-repudiation, and access control for PKI components.

Directory Protection Profile TOE
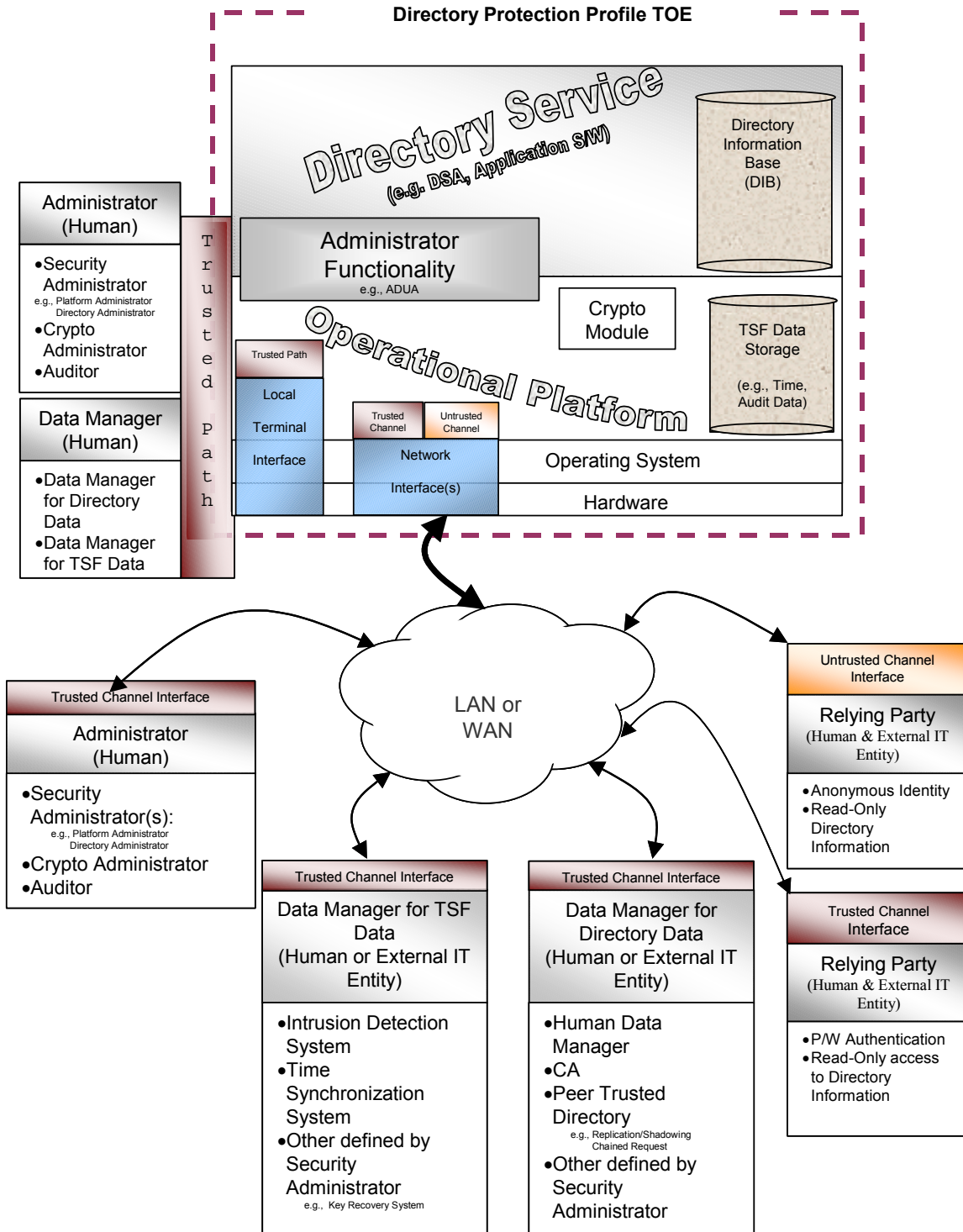
Figure 2.1 – Directory TOE and Users

TOE Boundary

Relying Party

Access Directory Data

•Read DIB Data
•Validate Entry Information

Peer Directory

Chained Request

•Authentication
3rd Party Introduction/
3rd Party Presentation

CA

Human

Manage Directory Data

•Replication
•Non-Repudiation
•Update DIB Data

I & A

Access Control

DIB

Directory Service

Trusted Interface

TSF Data

Time

Audit Records

Crypto Module

Crypto Administrator

Security Administrator

Audit Administrator

Administrator TOE

• Crypto
• Audit
• General

Manage TSF Data

• Time
• Read Audit

Intrusion Detection

Time Synchronization

Users

Security Services required by/of the TOE

Figure 2.2 – Directory Security Services

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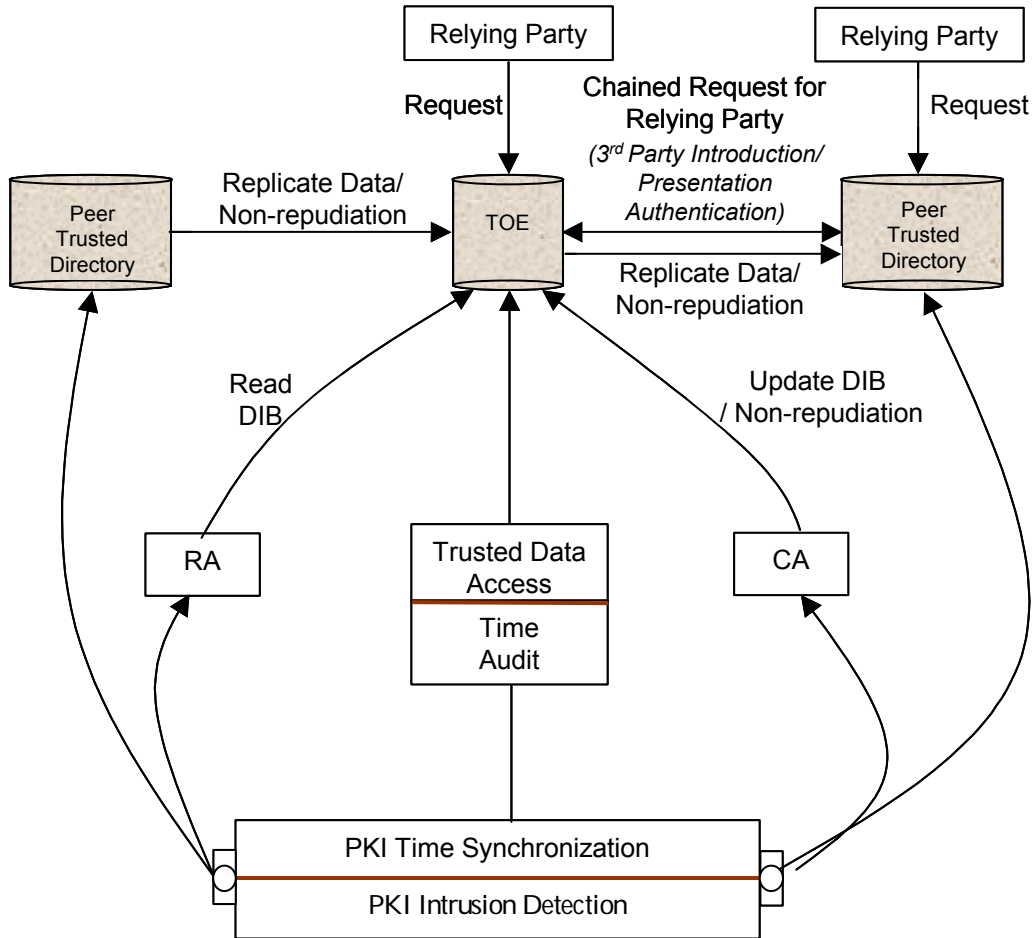
Figure 2.3 – TOE in a Distributed Directory

2.3   USERS

As illustrated in Figure 2.2, this PP defines three kinds of users: Relying Parties, Administrators, and Data Managers. The following describes how these users access the TOE, the security services they access, and how they are represented as roles in the TOE.

RELYING PARTIES are untrusted human users or external IT entities that rely on the repository of information maintained by the directory, i.e., the DIB. These users only have read access to the DIB. Their identity may be authenticated using a certificate or a password, or they may be anonymous. All access to the TOE is remote and may be over either a trusted channel, required for password authentication, or an untrusted channel. The TOE requires a single role, Relying Parties, to support these users.

ADMINISTRATORS are trusted human users who are responsible for the management and operation of the TOE. They may access the TOE locally over a trusted path or remotely over a crypto-based trusted channel. Remote administrators must be

authenticated with a certificate; local administrators may be authenticated using a password.

Administrators have expertise in aspects of operating the TOE and are responsible for its hardware, software and security functions. To isolate administrative actions, the PP requires at least three administrative roles, a crypto administrator for the cryptographic functions, an auditor for the audit functions, and a general security administrator for general administrative responsibilities. It's anticipated that a compliant implementation may refine and iterate the Security Administrator role as necessary to support component parts of the TOE, e.g., a Directory Administrator and a Platform Administrator. The Security Administrator(s) grant specific Data Managers access to a set of trusted data.

DATA MANAGERS are trusted human users or external IT entities responsible for providing or accessing a set of trusted data (TSF data). These managers are the authoritative source for the data provided by the directory service or used by the TOE, or they may need access to trusted data. Examples of data managers that provide trusted data include CA's that provide certificates and Revocation Lists (RLs), human data managers that update entries in the directory as granted access by an administrator, Peer Trusted Directories that update the DIB through a replication process, or provide authentication data for chained requests, or a time synchronization system that updates time. Examples of data managers that access trusted data include an intrusion detection system that reads audit records, and Peer Trusted Directories that are consumers of replicated DIB data from the TOE.

The TOE requires a single role, Data Manager, to support these users. The PP requires the Data Manager role has a user identity associated with a security administrator-specified set of trusted data for which they have access. For example, a CA (user) with identity CA_1 has update access to DIB entries in the CA_1 domain. This role is defined in this manner to support various architectures and policies regarding access and maintenance of the trusted data in the TOE. The ST author may refine the Data Manager role and its assignments to reflect the implementation.

2.4 SECURITY SERVICES

The TOE functional security requirements can be categorized as follows:
- Access control,
- Identification and Authentication,
- Replication,
- Non-repudiation,
- Audit,
- Trusted Channel/Path,
- Cryptographic Support,
- Administration and Management,
- Internal Capabilities

Access Control

The TOE includes an access control security policy that restricts access to the directory information. Relying Parties only have read-only access, and only security administrator-specified trusted data managers have update access. While the PP does not dictate protocols it does require compliant TOEs support replication, as part of a distributed directory system, and therefore the PP must require a standardized access control scheme for consistent access control over replicated data. This scheme is consistent with the current industry standard scheme Basic Access Control (BAC).

While multiple access control schemes are allowed, compliant TOEs are only required to implement one, BAC. Current industry Directory standards efforts also include a simplified version of BAC, Simplified Access Control (SAC), and a scheme to support Mandatory Access Control, referred to as Rule-based Access Control (RBAC). SAC is a functional subset of BAC and therefore it is not included in the requirements. RBAC not required for compliant TOEs.

The access control decisions are based on the security attributes for the DIB objects in the form of ACI items, and the subject attributes of the requesters. The subject attributes include distinguished name, user group, role, and authentication level. The ACI item attribute associates protected items and user classes with permissions. Rather than each DIB object having its own ACI item (or set of permissions), the directory has a set of ACI items for all the data in the DIB Access Control Domain. Each ACI item grants or denies permissions in regard to a set of specified users and protected items. The scope of the protected items can be a single DIB entry, attribute, or subtree of entries, resulting in an access control decision for a single request being based on multiple ACIs. Other ACI attributes include priority, and required authentication level.

Identification and Authentication
The TOE requires multiple Identification and Authentication (I&A) mechanisms for access to services residing on the TOE. The type of authentication mechanism required depends on the type of user, their credentials, and their location. Local administrators and data managers may authenticate using a password. Remote access for these users requires certificate-based authentication, and the access must be over a trusted channel.

The TOE requires several authentication options for Relying Parties. Anonymous access by Relying Parties is permitted and the TOE assigns the identity 'anonymous' for these users, and the communication may be over an untrusted channel. This identity is used for access control decisions. All non-anonymous authentication for relying parties must be over a trusted channel. Relying Parties may authenticate using a password, a certificate, or via "3rd party introduction" and "3rd party presentation" in a chained request.

"3rd party introduction" and "3rd party presentation" are authentication mechanisms for a relying party in a chained request. This mechanism requires the trusted peer directory presenting the 3rd party authentication be authenticated with a certificate. '3rd Party introduction' trusts that the peer directory correctly verified the authentication credentials of the relying party before passing the chained request to the TOE. "3rd Party presentation" trusts that the peer directory ensured the integrity and, if necessary, the

confidentiality of the authentication credentials passed to the TOE as part of the chained request.

Replication

The TOE includes requirements to support directory replication. Directory replication is the process used in a distributed directory environment in which a replica of a portion of the DIB is copied to and/or from other directories. This increases the availability of the Directory's DIB data within a system. The TOE requires the TSF to ensure the integrity of the replicated data it receives or sends and to ensure the security attributes are associated with the data.

Non-repudiation

The TOE requires non-repudiation services to support the TOE's role in a PKI to make RLs and certificates available according to their certificate policies. The non-repudiation service applies to the transmission of DIB data to or from the TOE through either updates to the DIB from a data manager or replication among peer trusted directories.   The non-repudiation requirements include both the generation and verification of evidence for non-repudiation, including a timestamp, and notification that evidence of receipt the TOE is waiting for is overdue.

The TOE also includes a directory security service, which can be considered a non-repudiation service, referred to as a 'verifiable journal of entries'. This service provides a means for a relying party to validate the source and integrity of the information provided in the DIB.   This service requires the TOE to provide a complete journal of the history of an entry and make it available to a relying party.
The TOE creates a digitally signed journal that includes a digitally signed record for each update to an entry in the DIB.   These journals are available to a relying party as an entry in the DIB.

Audit

The audit requirements for the TOE include generating records for auditable events, alarms and audit management. To isolate administrative actions the TOE requires that only the auditor role view, search, and sort the audit trail. Only the security administrator configures the behavior of the audit mechanisms including, setting thresholds, configuring auditable events, backs-up and deletes audit data, and manages audit data storage.

The TOE requires a minimum set of auditable events, and the minimum contents of the audit records. TOEs claiming compliance to this PP may include additional auditable events and record contents.   If they also include additional functional requirements audit records must able to be generated for the associated security relevant events.

In addition to generating auditable events, the TOE must monitor their occurrences and provide a Security Administrator-configurable threshold for determining a potential security violation. Once the TOE has detected a potential security violation, an alarm is generated and a message is displayed at the TOE's local console as well as each active

remote auditor and security administrator active sessions and those initiated before the alarm has been acknowledged. The message must contain the potential security violation and the TOE must make accessible all audit records associated with the potential security violation. The message will continue to be displayed until it has been acknowledged.

Trusted Channel/Path

The TOE is required to provide two types of encrypted communications: trusted channel and trusted path. Trusted channel refers to the encrypted connection that prevents disclosure and detects modification of data transmitted between the TOE and an external IT entity, e.g., an encrypted connection between the TOE and a trusted peer directory. Trusted path refers to the encrypted connection that prevents disclosure and detects modification of data transmitted between a human user and the TOE, e.g., a remote administration.

The trusted channel must be used for all password-based authentication functions, replication operations, and remote management of the directory service data. While the external trusted IT entities may initiate communications, it may be the case that the TOE is required to perform a "pull" operation (e.g., obtaining time from a time server). The trusted path must be used for relying party password-based authentication and all remote administration actions.

Cryptographic Support

The TOE includes security functions that depend on cryptographic operations. These include:
- digital signature verification for authentication, and for the journal of updates;
- encryption to prevent disclosure for a trusted channel, and a trusted path;
- cryptographic function to ensure integrity for self testing stored TSF data and TSF executable code, a trusted channel, and a trusted path;
- random number generation and a hashing function to support the above operations.

For medium robustness, a symmetric key size of at least 128 bits is required. For Digital Signatures, an equivalent degree of "security" is required for key cryptographic parameters in the algorithms used. For both the DSA and RSA algorithms, modulus sizes of at least 2048 are required to provide this degree of security. For medium robustness it's also required that whenever required functionality can be FIPS 140-2 validated, that that functionality be implemented in a cryptomodule.

The TOE requires the following algorithms be implemented by a cryptographic module:
- Encryption/Decryption using AES
- Digital Signature Generation/Verification using rDSA or ECDSA. Note: the DSA algorithm described in the DSS (FIPS 186-2) is limited to a maximum

modulus size of 1024 bits and is therefore not suitable for implementing digital signature functionality for medium robustness.

To support these operations the TSF must provide the following cryptographic key management functions:
- Key generation,
- Key establishment using: key agreement, key transport, manual loading, or automated loading; and
- Key destruction.

<u>**Administration and Management**</u>
The TOE includes functions and roles for administration and management of the trusted data. As described above in Section 2.3, the TOE includes three separate administrative roles, Cryptographic Administrator, Auditor, and Security Administrator, and a single trusted Data Manager role. These roles may be refined as necessary to support the implementation of a compliant TOE, e.g., the security administrator may be refined into a Directory Administrator and a Platform Administrator.

In addition to the roles, the TOE requires the interfaces, functionality and access control to support the administration and management of the TOE. The TOE includes management capabilities to turn on or off the following security functions: security alarms, replication, a journal of updates, and cryptomodule testing after key generation.

Through controlled access to TSF data the other TOE security functions are managed. TOEs claiming compliance to this PP may include additional management capabilities. If they also include additional functional requirements the associated management of the functions must also be considered.

<u>**Internal Capabilities**</u>
The TOE includes several internal security capabilities for its own protection or to support the availability of general TOE resources. For its own protection the TOE includes requirements that relate to the integrity and management of the mechanisms that provide the TSF and to the integrity of TSF data. These include self-testing, recovery from failure, SFP domain separation, non-bypassability of the TSP, and a reliable time-stamp. To support the availability of required resources, the TOE requires the TSF to enforce maximum quotas on the usage of disk space, processor time, and transport-layer representation for access from a network.

3 TOE SECURITY ENVIRONMENT

This section discusses the characteristics of environments and threat levels appropriate for medium robustness TOEs, and it describes the specific security aspects of the environment in which the directory is intended to be used and the manner in which it is expected to be employed. This information is provided to help organizations using this PP insure that the functional requirements specified by this medium robustness PP are appropriate for their intended application of a compliant TOE.

This section includes the following:
- Discussion of medium robustness;
- Assumptions about the security aspects of a compliant TOE environment;
- Threats to TOE assets or to the TOE environment which must be countered; and
- Organizational security policies that compliant TOEs must enforce.

3.1 *CHARACTERIZING MEDIUM ROBUSTNESS*

Robustness is defined as a TOE characteristic that describes how well the TOE can protect itself and its resources. The more robust the TOE, the better it is able to protect itself. This section relates the defining factors of the IT environment, authorization, and value of resources to the selection of appropriate robustness levels.

3.1.1 TOE ENVIRONMENT DEFINING FACTORS

In trying to specify the environments in which TOEs with various levels of robustness are appropriate, it is useful to first discuss the two defining factors that characterize that environment: the **value of the resources** and **authorization of the entities** to access those resources.

In general terms, the environment for a TOE can be characterized by the authorizations (or lack of authorization) that the least trustworthy entity has with respect to the TOE resources with the highest value (i.e. the TOE itself and all of the data processed by the TOE). There are an infinite number of combinations of entity authorizations and resource values since there are an infinite number of potential environments and a variety of authorizations defined by a given organization. These two environmental factors are used in subsequent sections to assist in determining the robustness level required for in identified TOE for a given system in an environment.

Value of Resources

The value of resources associated with a TOE is determined by the value of data being processed or used by the TOE, as well as the TOE itself in the system (for example, the directory and the role it plays supporting a PKI). The "value" is assigned by the using organization. For example, low-value data might be equivalent to data marked by the U.S. Government as "FOUO", while high-value data may be equivalent to data marked by the U.S. Government as "Top Secret". In this example, a loss of life may occur if Top Secret information is compromised or if the information were unavailable past an

acceptable period of time. It is therefore considered high-valued information. In a commercial enterprise, low-value data may be an organizational structure as captured in the corporate on-line phone book, while high-value data may include corporate research results for the next generation product. In this example, millions of dollars in revenue could be lost if the research results are compromised or lost. It is therefore considered high-value information. Note that when considering the value of the data one must also consider the value of data or resources that are accessible through exploitation of the TOE. For example, a directory may contain data that is available for anyone to read and has its own integrity protection (e.g., revocation lists), however if this data was updated by an unauthorized and rogue user, the authentication mechanisms that protect high value data and depend on the correctness of the revocation list could be compromised. In this example, the directory protects high value data, and therefore must be treated as a high-value part of the TOE.

Authorization of Entities

An authorization is defined as the access control information that conveys the privileges of an entity (administrators, relying parties, other IT systems). The authorizations that entities have with respect to the TOE (and thus the resources of that TOE, including the TOE itself) are an abstract concept that includes a combination of the trustworthiness of an entity and the access privileges granted to that entity with respect to the resources of the TOE. Some entities may hold authorizations to access all data on the TOE while others may hold minimal authorizations to access few or no TOE resources. The level of access and the abilities granted (read, modify, delete) determine the level of trust for an entity.

3.1.2 SELECTION OF APPROPRIATE ROBUSTNESS LEVELS

As defined above, robustness describes how well the TOE can protect itself and its resources. The more robust the TOE, the better it is able to protect itself. This section relates the defining factors of the IT environment, authorization, and value of resources to the selection of appropriate robustness levels.

When assessing any environment with regards to Information Assurance (IA), the critical point to consider is the likelihood of a compromise. This likelihood is somewhat dependent on the value of the TOE and resident data as well as logical connectivity and physical location. It follows that as the likelihood of an attempted resource compromise increases, the robustness of an appropriate TOE should also increase. It is critical to note that several combinations of environmental factors will result in environments in which the likelihood of an attempted compromise is similar. Consider the following two cases:

The first case is a TOE that processes low-value data. This TOE is connected to the Internet and is accessible by authorized entities. In this case, the least trusted entities are unauthorized entities exposed to the TOE as a result of Internet connectivity. Since only low-value data is being processed, the likelihood that unauthorized entities would attempt to gain access to the system is low. In this instance, TOE compliance with a basic robustness PP is sufficient.

The second case is a TOE that processes high-value information. In this example, the TOE is a stand-alone system that is both logically isolated from any external connections and is physically protected. Additionally, every entity with physical and logical access to the TOE holds the highest authorizations thereby assuring that only highly trusted users are authorized to access the TOE. In this case, even though high value information is processed, it is unlikely that a compromise of the TOE and resident information will occur simply because of the physical and logical isolation and the trustworthiness of the entities. Once again, selection of a basic robustness TOE is appropriate.

The preceding examples demonstrated that it is possible for different combinations of entity authorization/resource values to result in a similar likelihood of an attempted compromise. As mentioned earlier, the robustness of a system is an indication of the protection being provided to counter compromise attempts. Therefore, a basic robustness system should be sufficient to counter compromise attempts where the likelihood of an attempted compromise is low. The following chart depicts the "universe" of environments characterized by the two factors discussed in the previous section: on one axis is the authorization defined for the least trustworthy entity, and on the other axis is the highest value of resources associated with the TOE.

As depicted in Figure 3.1, the robustness of the TOEs required in each environment steadily increases as one goes from the upper left of the chart to the lower right; this corresponds to the need to counter increasingly likely attack attempts by the least trustworthy entities in the environment. Note that the shading of the chart is intended to reflects the notion that different environments engender similar levels of "likelihood of attempted compromise", signified by a similar color. Further, the delineations between such environments are not stark, but rather are finely grained and gradual.

While it would be possible to create many different "levels of robustness" at small intervals along the "Increasing Robustness Requirements" line to counter the increasing likelihood of attempted compromise due to those attacks, it would not be practical nor particularly useful. Instead, in order to implement the robustness strategy where there are only three robustness levels: Basic, Medium, and High, the graph is divided into three sections, with each section corresponding to set of environments where the likelihood of attempted compromise is roughly similar. This is graphically depicted in Figure 3.2.
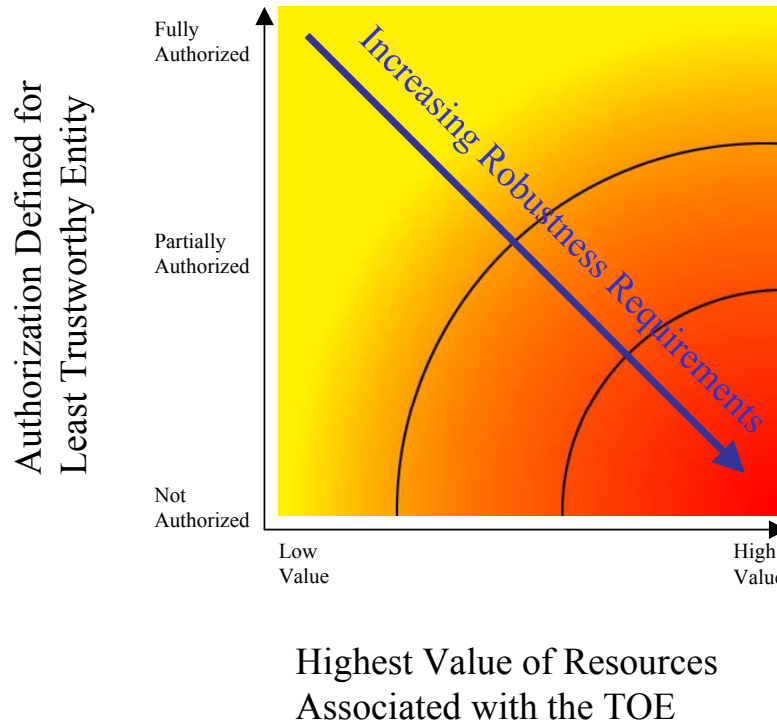
Figure 3.1 – Robustness Requirements

In Figure 3.2 the "dots" represent given instantiations of environments; like-colored dots define environments with a similar likelihood of attempted compromise. Correspondingly, a TOE with a given robustness should provide sufficient protection for environments characterized by like-colored dots. In choosing the appropriateness of a given robustness level TOE PP for an environment, then, the user must first consider the lowest authorization for an entity as well as the highest value of the resources in that environment. This should result in a "point" in the chart above, corresponding to the likelihood that that entity will attempt to compromise the most valuable resource in the environment. The appropriate robustness level for the specified TOE to counter this likelihood can then be chosen.

The difficult part of this activity is differentiating the authorization of various entities, as well as determining the relative values of resources; (e.g., what constitutes "low value" data vs. "medium value" data). Because every organization will be different, a rigorous definition is not possible.

Highest Value of Resources Associated with the TOE
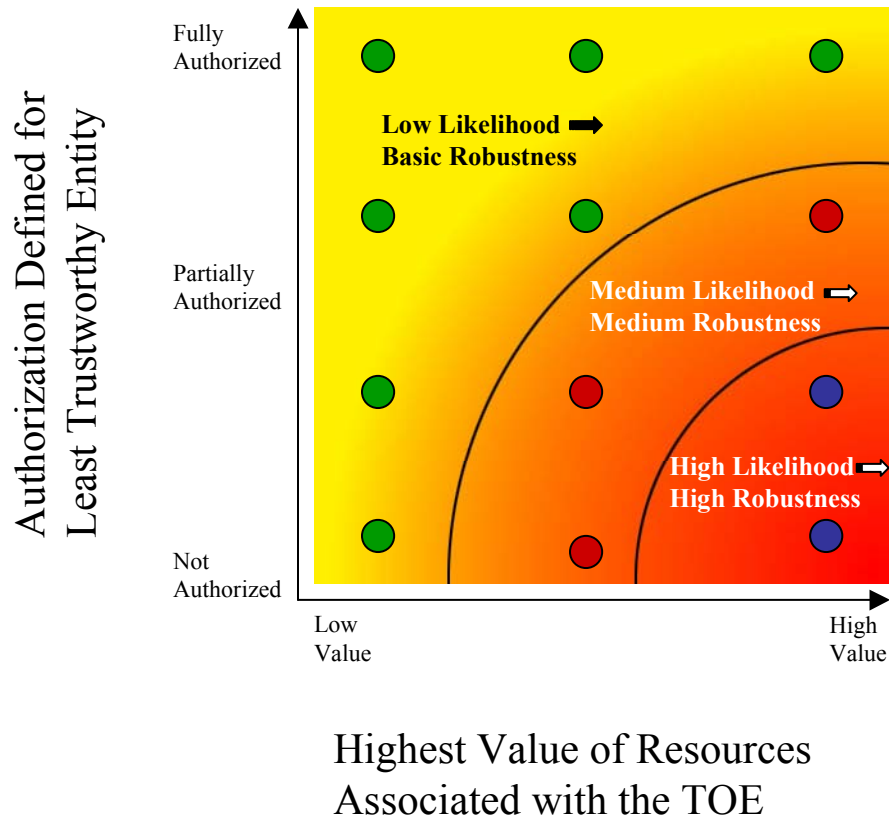
Figure 3.2 – Robustness Levels

3.1.3 Medium Robustness

Medium robustness TOEs fall in the central area of the robustness figures discussed above. A medium robustness TOE is considered sufficient protection for environments where the likelihood of an attempted compromise is medium. This implies that the motivation of the threat agents will be average in environments that are suitable for TOEs of medium robustness. Note that this also implies that the resources and expertise of the threat agents really are not factors that need to be considered, because highly sophisticated threat agents will not be motivated to use great expertise or extensive resources in an environment where medium robustness is suitable.

The medium motivation of the threat agents can be reflected in a variety of ways. One possibility is that the value of the data processed or protected by the TOE will be only medium, thus providing little motivation of even a totally unauthorized entity to attempt to compromise the data. Another possibility, (where higher value data is processed or protected by the TOE) is that the procuring organization will provide environmental controls (that is, controls that the TOE itself does not enforce) in order to ensure that threat agents that have generally high motivation levels (because of the value of the data) cannot logically or physically access the TOE (e.g., all users are "vetted" to help ensure their trustworthiness, and connectivity to the TOE is restricted).

It is important to note to vendors and end users that any IT entity that is used to protect National Security information, and employs cryptography as a protection mechanism, will require the TOE's key management techniques to be approved by NSA when the TOE is fielded.

3.2   SECURE USAGE ASSUMPTIONS

Table 3.1 lists the Secure Usage Assumptions.

Table 3.1 – Secure Usage Assumptions

Assumption	Assumption Description
A.PHYSICAL	Physical security, commensurate with the value of the TOE and the data it contains, is assumed to be provided by the IT environment.
A.NO_GENERAL_PURPOSE	There are no general-purpose computing or storage repository capabilities (e.g., compilers, editors, web servers, database servers or user applications) available on the TOE.
A.REMOTE_ADUA_ENVIRONMENT	The accreditation process will ensure that the procuring organization will manage and protect the ADUA in a manner that is commensurate with this PP.
A.REMOTE_ADUA_FUNCTIONALITY	Remote ADUA applications are trusted applications that would comply with the security requirements of this PP that are applicable to the ADUA.
A.REPLICATION_SECURITY_POLICY_ENFORCEMENT	Before enabling replication, the security administrator must, via out-of-band analysis, ensure the replica data received or transmitted is managed in a manner commensurate with the TOE security policy.
A.USER_INFORMATION_FLOW	Users will protect all information that is displayed or printed in accordance with both the classification of the data and local security policies.

3.3   THREATS TO SECURITY

In addition to helping define the robustness appropriate for a given environment, the threat agent is a key component of the formal threat statements in the PP. Threat agents are typically characterized by a number of factors such as *expertise*, *available resources*, and *motivation*. Because each robustness level is associated with a variety of

environments, there are corresponding varieties of specific threat agents (that is, the threat agents will have different combinations of motivation, expertise, and available resources) that are valid for a given level of robustness. The following discussion explores the impact of each of the threat agent factors on the ability of the TOE to protect itself (that is, the robustness required of the TOE).

The *motivation* of the threat agent seems to be the primary factor of the three characteristics of threat agents outlined above. Given the same expertise and set of resources, an attacker with low motivation may not be as likely to attempt to compromise the TOE. For example, an entity with no authorization to low value data none-the-less has low motivation to compromise the data; thus a basic robustness TOE should offer sufficient protection. Likewise, the fully authorized user with access to highly valued data similarly has low motivation to attempt to compromise the data, thus again a basic robustness TOE should be sufficient.

Unlike the motivation factor, however, the same can't be said for *expertise*. A threat agent with low motivation and low expertise is just as unlikely to attempt to compromise a TOE as an attacker with low motivation and high expertise; this is because the attacker with high expertise does not have the motivation to compromise the TOE even though they may have the expertise to do so. The same argument can be made for *resources* as well.

Therefore, when assessing the robustness needed for a TOE, the motivation of threat agents should be considered a "high water mark". *That is, the robustness of the TOE should increase as the motivation of the threat agents increases.*

Having said that, the relationship between expertise and resources is somewhat more complicated. In general, if resources include factors other than just raw processing power (money, for example), then expertise should be considered to be at the same "level" (low, medium, high, for example) as the resources because money can be used to purchase expertise. Expertise in some ways is different, because expertise in and of itself does not automatically procure resources. However, it may be plausible that someone with high expertise can procure the requisite amount of resources by virtue of that expertise (for example, hacking into a bank to obtain money in order to obtain other resources).

It may not make sense to distinguish between these two factors; in general, it appears that the only effect these may have is to lower the robustness requirements. For instance, suppose an organization determines that, because of the value of the resources processed by the TOE and the trustworthiness of the entities that can access the TOE, the motivation of those entities would be "medium". This normally indicates that a medium robustness TOE would be required because the likelihood that those entities would attempt to compromise the TOE to get at those resources is in the "medium" range. However, now suppose the organization determines that the entities (threat agents) that are the least trustworthy have no resources and are unsophisticated. In this case, even though those threat agents have medium motivation, the likelihood that they would be

able to mount a successful attack on the TOE would be low, and so a basic robustness TOE may be sufficient to counter that threat.

It should be clear from this discussion that there is no "cookbook" or mathematical answer to the question of how to specify exactly the level of motivation, the amount of resources, and the degree of expertise for a threat agent so that the robustness level of TOEs facing those threat agents can be rigorously determined. However, an organization can look at combinations of these factors and obtain a good understanding of the likelihood of a successful attack being attempted against the TOE. Each organization wishing to procure a TOE must look at the threat factors applicable to their environment; discuss the issues raised in the previous paragraph; consult with appropriate accreditation authorities for input; and document their decision regarding likely threat agents in their environment. The important general points we can make are:
The motivation for the threat agent defines the upper bound with respect to the level of robustness required for the TOE.
A threat agent's expertise and/or resources that are "lower" than the threat agent's motivation (e.g., a threat agent with high motivation but little expertise and few resources) may lessen the robustness requirements for the TOE (see next point, however).
The availability of attacks associated with high expertise and/or high availability of resources (for example, via the Internet or "hacker chat rooms") introduces a problem when trying to define the expertise of, or resources available to, a threat agent.

Table 3.2 lists the threats to security.

Table 3.2 – Threats to Security

Threat	Description of Threat
T. ADMIN_ ERROR	An administrator may incorrectly install or configure the TOE, or install a corrupted TOE, resulting in ineffective security mechanisms.
T.ADMIN_ROGUE	An administrator's intentions may become malicious resulting in user or TSF data being compromised.
T.AUDIT_ COMPROMISE	A malicious user or process may view audit records, cause audit records to be lost or modified, or prevent future audit records from being recorded, thus masking a user's action.
T.CORRUPTED_ IMPLEMENTATION	Unintentional or intentional errors in implementation of the TOE design may occur, leading to flaws that may be exploited by a malicious user or program.
T.CRYPTO_ COMPROMISE	A malicious user or process may cause key, data or executable code associated with the cryptographic functionality to be inappropriately accessed (viewed, modified, or deleted), thus compromise the cryptographic mechanisms and the data protected by those mechanisms.

T.FLAWED_DESIGN	Unintentional or intentional errors in requirements specification or design of the TOE may occur, leading to flaws that may be exploited by a malicious user or program.
T.MALICIOUS_TSF_ COMPROMISE	A malicious user or process may cause TSF data or executable code to be inappropriately accessed (viewed, modified, or deleted).
T.MASQUERADE	A user or process may masquerade as another entity in order to gain unauthorized access to data or TOE resources.
T.POOR_TEST	Lack of or insufficient tests to demonstrate that all TOE security functions operate correctly (including in a fielded TOE) may result in incorrect TOE behavior being discovered thereby causing potential security vulnerabilities.
T.REPLAY	A user may gain inappropriate access to the TOE by replaying authentication information.
T.RESIDUAL_DATA	A user or process may gain unauthorized access to data through reallocation of TOE resources from one user or process to another.
T.RESOURCE_ EXHAUSTION	A malicious process or user may block others from system resources (e.g., CPU time) via a resource exhaustion denial of service attack.
T.SPOOFING	An entity may misrepresent itself as the TOE to obtain authentication data.
T.UNATTENDED_ SESSION	A user may gain unauthorized access to an unattended session.
T.UNAUTHORIZED_ ACCESS	A user may gain access to user data for which they are not authorized according to the TOE security policy.
T.UNIDENTIFIED_ ACTIONS	The administrator may fail to notice potential security violations, thus limiting the administrator's ability to identify and take action against a possible security breach.
T.UNKNOWN_ STATE	When the TOE is initially started or restarted after a failure, the security state of the TOE may be unknown.

3.4 ORGANIZATIONAL SECURITY POLICIES

Table 3.3 lists the organizational security policies.

Table 3.3 – Organizational Security Policies

Policy	Policy Description
P.ACCESS_BANNER	The TOE shall display an initial banner describing restrictions of use, legal agreements, or any other appropriate information to which administrators consent by accessing the system.
P.ACCOUNTABILITY	The authorized users of the TOE shall be held accountable for their actions within the TOE.
P.ADMIN_ACCESS	Administrators shall be able to administer the TOE both locally and remotely through protected communications channels.
P.CRYPTOGRAPHY_ VALIDATED	Where the TOE requires FIPS-approved security functions, only NIST FIPS validated cryptography (methods and implementations) are acceptable for key management (i.e.; generation, access, distribution, destruction, handling, and storage of keys) and cryptographic services (i.e.; encryption, decryption, signature, hashing, key distribution, and random number generation services).
P.CRYPTOGRAPHIC_ FUNCTIONS	The TOE shall provide cryptographic functions for its own use, including encryption/decryption and digital signature operations.
P.NONREPUDIATION	The TOE must provide non-repudiation services for transmitted and received DIB data. The non-repudiation services include both the generation and verification of evidence for non-repudiation, including a timestamp, and notification that evidence of receipt the TOE is waiting for is overdue. The TOE must also provide a 'verifiable journal of entries', which is a record of the history of changes to an entry or attribute in the DIB and provide evidence that the entry or attribute is valid.
P.RATINGS_ MAINTENANCE	Procedures to maintain the TOE's rating must be in place, and these procedures must be implemented to maintain the TOE's rating once it is evaluated.
P.DISTRIBUTED_DIREC TORY_SUPPORT	Directories shall be able to support replication and chaining functions. To support replication directories shall be able to replicate (both produce and consume) definable subtrees to other directories (peer trusted directories). Directories shall be able to support 3rd party authentication mechanisms for chaining.
P.VULNERABILITY_ ANALYSIS_TEST	The TOE must undergo appropriate independent vulnerability analysis and penetration testing to demonstrate that the TOE is resistant to an attacker possessing a medium attack potential.

4   SECURITY OBJECTIVES

This chapter describes the security objectives. These security objectives are divided between the Security Objectives for the TOE (i.e., security objectives addressed directly by the TOE), and the Security Objectives for the Operating Environment (i.e., security objectives addressed by the IT domain or by non-technical or procedural means).

4.1   SECURITY OBJECTIVES FOR THE TOE

Table 4.1 contains the Security Objectives for the TOE

Table 4.1 – Security Objectives for the TOE

Objective	Objective Description
O.ADMIN_ROLE	The TOE will provide administrator roles to isolate administrative actions.
O.AUDIT_ GENERATION	The TOE will provide the capability to detect and create records of security-relevant events associated with users.
O.AUDIT_ PROTECTION	The TOE will provide the capability to protect audit information.
O.AUDIT_REVIEW	The TOE will provide the capability to selectively view audit information, and alert the administrator of identified potential security violations.
O.AVAILABILITY	The TOE shall provide administrators with functions to ensure continuous operation of the TOE, and availability of all audit data, predictable availability of its DIB data.
O.CHANGE_ MANAGEMENT	The configuration of, and all changes to, the TOE and its development evidence will be analyzed, tracked, and controlled throughout the TOE's development.
O.CORRECT_TSF_ OPERATION	The TOE will provide the capability to test the TSF to ensure the correct operation of the TSF at a customer's site.
O.CRYPTOGRAPHY_ VALIDATED	The TOE shall use NIST FIPS 140-2 validated cryptomodules for cryptographic services implementing FIPS-approved security functions and random number generation services used by cryptographic functions.
O.CRYPTOGRAPHIC_ FUNCTIONS	The TOE shall provide cryptographic functions for its own use, including encryption/decryption and digital signature operations.
O.DISPLAY_BANNER	The TOE will display an advisory warning regarding use of the TOE.
O.DOCUMENT_KEY_ LEAKAGE	The bandwidth of channels that can be used to compromise key material shall be documented.
O.MAINT_MODE	The TOE shall provide a mode from which recovery or initial startup procedures can be performed.
O.MANAGE	The TOE will provide all the functions and facilities necessary to support the administrators in their management of the security of the TOE, and restrict these functions and facilities from unauthorized use.

O.MEDIATE	The TOE must protect user data in accordance with its security policy.
O.NON-REPUDIATION	At the option of an administrator, the TSF must be able to provide non-repudiation services for transmitted and received DIB data. These services must include both the generation and verification of evidence for non-repudiation, including a timestamp, and notification that the evidence of receipt the TOE is waiting for is overdue. At the option of an administrator, the TSF must also be able to keep a 'verifiable journal of updates' for any entry or attribute in the directory, and provide evidence that the entry or attribute is valid.
O.RATINGS_ MAINTENANCE	Procedures to maintain the TOE's rating will be documented and followed.
O.REPLAY_ DETECTION	The TOE will provide a means to detect and reject the replay of authentication data.
O.DISTRIBUTED_DIR ECTORY_SUPPORT	The TSF shall be able to replicate definable subtrees to (produce) and accept replications of definable subtrees from (consume) other directories. The TSF shall be to authenticate using 3rd party introduction and 3rd party presentation for chaining.
O.RESIDUAL_ INFORMATION	The TOE will ensure that any information contained in a protected resource is not released when the resource is reallocated.
O.RESOURCE_ SHARING	The TOE shall provide mechanisms that mitigate attempts to exhaust CPU time and available network connections provided by the TOE.
O.ROBUST_ADMIN_ GUIDANCE	The TOE will provide administrators with the necessary information for secure delivery and management.
O.ROBUST_TOE_ ACCESS	The TOE will provide mechanisms that control a user's logical access to the TOE and to explicitly deny access to specific users when appropriate.
O.SELF_ PROTECTION	The TSF will maintain a domain for its own execution that protects itself and its resources from external interference, tampering or unauthorized disclosure.
O.SOUND_DESIGN	The design of the TOE will be the result of sound design principles and techniques; the design of the TOE, as well as the design principles and techniques, are adequately and accurately documented.
O.SOUND_ IMPLEMENTATION	The implementation of the TOE will be an accurate instantiation of its design, and is adequately and accurately documented.
O.THOROUGH_ FUNCTIONAL_ TESTING	The TOE will undergo appropriate security functional testing that demonstrates the TSF satisfies the security functional requirements.
O.TIME_STAMPS	The TOE shall provide reliable time stamps and the capability for the administrator to set the time used for these time stamps.
O.TRUSTED_PATH	The TOE will provide a means to ensure users are not communicating with some other entity pretending to be the

	TOE, and that the TOE is communicating with an authorized IT entity and not some other entity pretending to be an authorized IT entity.
O.VULNERABILITY_ ANALYSIS_TEST	The TOE will undergo appropriate independent vulnerability analysis and penetration testing to demonstrate the design and implementation of the TOE does not allow attackers with medium attack potential to violate the TOE's security policies.

4.2   SECURITY OBJECTIVES FOR THE ENVIRONMENT

Table 4.2 contains security objectives for the environment.

Table 4.2 – Security Objectives for the IT Environment

OE.PHYSICAL	Physical security, commensurate with the value of the TOE and the data it contains, is assumed to be provided by the IT environment.
OE.NO_GENERAL_PURPOSE	There are no general-purpose computing or storage repository capabilities (e.g., compilers, editors, web servers, database servers or user applications) available on the TOE.
OE.REMOTE_ADUA_ENVIRONMENT	The accreditation process will ensure that the procuring organization will manage and protect the ADUA in a manner that is commensurate with this PP.
OE.REMOTE_ADUA_FUNCTIONALITY	Remote ADUA applications are trusted applications that would comply with the security requirements of this PP that are applicable to the ADUA.
OE.REPLICATION_SECURITY_POLICY_E NFORCEMENT.	Before enabling replication, the security administrator must, via out-of-band analysis, ensure the replica data received or transmitted is managed in a manner commensurate with the TOE security policy.
OE.TRUSTED_PATH	Remote authorized IT entities in conjunction with the TOE must provide a means to ensure users are not communicating with some other entity pretending to be the TOE, and that the TOE is communicating with an authorized IT entity and not some other entity pretending to be an authorized IT entity.
OE.USER_INFORMATION_FLOW	Users and Administrators will protect all information that is displayed or printed in accordance with both the classification of the data and local security policies.

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5   IT SECURITY REQUIREMENTS

This section provides the TOE security functional and assurance requirements that must be satisfied by a Protection Profile-compliant TOE, and the IT environment security functional requirements on which the TOE relies. These requirements consist of functional components from Part 2 of the CC, assurance components from Part 3 of the CC, Common Criteria interpretations, NIAP interpretations, and explicit functional components derived from the CC components.

TOE Subjects and Objects

The following describes the TOE subjects and objects, and provides a basis for the security functional requirements (SFR) representation of its security services.
The subjects are the users and their internal TOE representation acting on their behalf, e.g., TOE processes. The objects are the data in the repository of information maintained by the directory, including the entries and their attributes, i.e., the DIB.

An important nuance to the definition of the objects in the TOE is that there is trusted data, i.e., TSF data among the DIB. So while the directory is responsible for controlling access to the DIB data it also relies on the certificates and RLs in the DIB for its own certificate-based security mechanisms, e.g., to validate signatures for authentication.

Formatting Conventions

The following formatting conventions apply to the TOE Security Functional Requirements and the Requirements for the IT Environment.

The CC allows several operations to be performed on functional requirements; *refinement*, *selection*, *assignment*, and *iteration* are defined in paragraph 2.1.4 of Part 2 of the CC. Each of these operations is used in this PP.

The **refinement** operation is used to add detail to a requirement, and thus further restricts a requirement. Refinement of security requirements is denoted by **bold text**.

The **selection** operation is used to select one or more options provided by the CC in stating a requirement. Selections are denoted by *italicized text*.

The **assignment** operation is used to assign a specific value to an unspecified parameter, such as the length of a password. An assignment is indicated by showing the value in square brackets, [ST assignment_value].

Application notes provide additional information for the reader, but do not specify requirements. Application notes are denoted by *italicized text.*

The **iteration** operation is used when a component is repeated with varying operations. An iteration is denoted by showing the iteration number in parenthesis following the component identifier, (iteration_number). (*) refers to all iterations of a component.

5.1 TOE SECURITY FUNCTIONAL REQUIREMENTS

The functional security requirements for the TOE consist of the following components derived from Part 2 of the CC, CC interpretations, NIAP interpretations, and explicit components, summarized in the Table 5.1 below.

Table 5.1 – Security Functional Components

Functional Components	
FAU_ARP.1	Security alarms
FAU_ARP_ACK_DIR_EXP.1	Security alarm acknowledgement for Directory
FAU_GEN.1-NIAP-0410	Audit data generation
FAU_GEN.2-NIAP-0410	User identity association
FAU_SAA.1-NIAP-0407	Potential violation analysis
FAU_SAR.1(1)	Audit review (Auditor Role)
FAU_SAR.1(2)	Audit review (External Audit Analysis)
FAU_SAR.2	Restricted audit review
FAU_SAR.3	Selectable audit review
FAU_SEL.1-NIAP-0407	Selective audit
FAU_STG.1-NIAP-0429	Protected audit trail storage
FAU_STG.3	Action in case of possible audit data loss
FAU_STG.NIAP-0429-1	Site-configurable prevention of audit data loss
FCO_NRO_EXP.1	Selective proof of origin for Directory Data
FCO_NRR_EXP.1	Selective proof of receipt for Directory Data
FCS_BCM_EXP.1	Baseline cryptographic module
FCS_CKM.1	Cryptographic key generation (for symmetric keys using RNG)
FCS_CKM_EXP.2	Cryptographic key establishment
FCS_CKM.4	Cryptographic key destruction

Functional Components	
FCS_COP_EXP.2	Cryptographic operation (encryption/decryption using AES)
FCS_COP_EXP.3	Cryptographic operation (digital signature generation/verification)
FCS_COP_EXP.5	Cryptographic operation (random number generation)
FCS_COP_EXP.6	Cryptographic operation (cryptographic hashing function)
FDD_DAU_EXP.1	Verifiable journal of updates
FDD_RPL_EXP.1	Replication of directory data with security attributes
FDP_ACC.2	Complete access control
FDP_ACF.1	Security attribute based access control [Directory Basic Access Control SFP]
FDP_RIP.2	Full residual information protection
FIA_AFL.1-NIAP-0425	Authentication failure handling
FIA_ATD.1(1)	User attribute definition (Relying Party without a certificate, including anonymous access)
FIA_ATD.1(2)	User attribute definition (Remote Administrator, Remote Data Manager, and Relying Party with a certificate)
FIA_ATD.1(3)	User attribute definition (Local Administrator)
FIA_UAU.1	Timing of authentication (anonymous Relying Party)
FIA_UAU.2	User authentication before any action
FIA_UAU.5	Multiple authentication mechanisms
FIA_UID.2	User identification before any action
FIA_USB.1-NIAP-0351	User-subject binding
FMT_MOF.1(1)	Management of security functions behaviour (directory functions)
FMT_MOF.1(2)	Management of security functions behaviour (cryptographic module testing)

Functional Components	
FMT_MSA.1	Management of security attributes [directory basic access control attributes]
FMT_MTD.1(1)	Management of TSF data (administration of Security Functions)
FMT_MTD.1(2)	Management of TSF data (cryptographic TSF data)
FMT_MTD.1(3)	Management of TSF data (time TSF data)
FMT_MTD.1(4)	Management of TSF data (Subsets of TSF data)
FMT_MTD.2(1)	Management of limits on TSF data (processor time percentage)
FMT_MTD.2(2)	Management of limits on TSF data (transport-layer quotas)
FMT_SMF.1	Specification of management functions
FMT_SMR.2(1)	Restrictions on security roles (strict separation)
FMT_SMR.2(2)	Restrictions on security roles (data administration and users)
FPT_ITA.	Inter-TSF availability within a defined availability metric
FPT_RCV.2-NIAP-0406	Recovery from failure
FPT_RPL.1	Replay detection
FPT_RVM.1	Non-bypassability of the TSP
FPT_SEP.2-NIAP-0424	SFP domain separation
FPT_STM.1	Reliable time stamps
FPT_TDC.1(1)	Inter-TSF basic TSF data consistency [Directory Time for certificate-based security mechanisms and non-repudiation services]
FPT_TDC.1(2)	Inter-TSF basic TSF data consistency (Distinguished Name character support)
FPT_TST_EXP.4	TSF testing
FPT_TST_EXP.5	Cryptographic testing

Functional Components	
FRU_RSA.1(1)	Maximum quotas (processor time)
FRU_RSA.1(2)	Maximum quotas (transport-layer)
FTA_SSL.1	TSF-initiated session locking
FTA_SSL.2	User-initiated locking
FTA_SSL.3(1)	TSF-initiated termination (remote administration session)
FTA_SSL.3(2)	TSF-initiated termination (remote directory service session)
FTA_TAB.1	Default TOE access banners
FTA_TSE.1	TOE session establishment
FTP_ITC.1(1)	Inter-TSF trusted channel (prevention of disclosure)
FTP_ITC.1(2)	Inter-TSF trusted channel (detection of modification)
FTP_TRP.1(1)	Trusted Path (prevention of disclosure)
FTP_TRP.1(2)	Trusted Path (detection of modification)

5.1.1 Class FAU: Security audit

For the audit functionality, the following requirements are written with the intent that the auditor is responsible for reviewing the audit trail, but the security administrator(s) is responsible for configuring the behavior of the audit mechanisms (setting thresholds, configuring which events are to be audited, etc.).

FAU_ARP.1 Security alarms

FAU_ARP.1.1 – The TSF shall [immediately display a message identifying the potential security violation, and make accessible the audit record contents associated with the auditable event(s) that generated the alarm, at the:

    a. local console;

    b. remote auditor and security administrator sessions that exist;

    c. remote auditor and security administrator sessions that are initiated before the alarm has been acknowledged; and

    d. [*selection: [ST assignment: other methods determined by the ST author], no other methods]*]

upon detection of a potential security violation.

> *Application Note: The TSF provides a message to the local console regardless of whether an administrator is logged in. To ensure administrators are aware of the alarm as soon as possible, a message is also displayed to all the remote Auditor and Security Administrator existing sessions and any new sessions until the alarm has been acknowledged. The audit records contents associated with the alarm may or may not be part of the message displayed, however the relevant audit information must be available to both the auditor and the security administrator.*

> *It is acceptable for the ST author to fill the open assignment with none, if no other methods are included in the TOE. The following component, FAU_ARP_ACK_DIR_EXP.1, defines the requirement for acknowledgement and notification of the acknowledgement.*

Explicit: Security alarm acknowledgement for Directory (FAU_ARP_ACK_DIR_EXP.1)

FAU_ARP_ACK_DIR_EXP.1.1 – The TSF shall display the message identifying the potential security violation and make accessible the audit record contents associated with the auditable event(s) until it has been acknowledged.

FAU_ARP_ACK_DIR_EXP.1.2 – The TSF shall display a message identifying a reference to the potential security violation and notice that it's been acknowledged at the time of the acknowledgement at the:

  a. local console; and

  b. remote auditor and security administrator sessions that received the alarm.

> *Application Note: This explicit requirement is necessary since a CC requirement does not exist to ensure an administrator will be aware of the alarm. The intent is to ensure that if an administrator is logged in and not physically at the console or remote workstation the message will remain displayed until they have acknowledged it. The message will not be scrolled off the screen due to other activity taking place (e.g., the Audit Administrator is running an audit report)..*

> *FAU_ARP_ACK_DIR_EXP.1.2 ensures that each administrator that received the alarm message also receives the acknowledgement message, which includes some form of reference to the alarm message, who acknowledged the message and when.*

FAU_GEN.1-NIAP-0410   Audit data generation

FAU_GEN.1.1-NIAP-0410 – The TSF shall be able to generate an audit record of the following auditable events:

    a. start-up and shutdown of the audit functions;

    b. all auditable events listed in Table 5.2; and

    c. [*selection: [ST assignment: events at a basic level of audit introduced by the inclusion of additional SFRs determined by the ST author], [ST assignment: events commensurate with a basic level of audit introduced by the inclusion of explicit requirements determined by the ST author], "no additional events"*].

    Application Note: For the selection, the ST author should choose one or both of the assignments (as detailed in the following paragraphs), or select "no additional events".

    For the first assignment, the ST author augments the table (or lists explicitly) the audit events associated with the basic level of audit for any SFRs that the ST author includes that are not included in this PP.

    Likewise, for the second assignment the ST author includes audit events that may arise due to the inclusion of any explicit requirements not already in the PP. Because "basic" audit is not defined for such requirements, the ST author will need to determine a set of events that are commensurate with the type of information that is captured at the basic level for similar requirements.

    If no additional (CC or explicit) SFRs are included, or if additional SFRs are included that do not have "basic" audit associated with them, then it is acceptable to assign "no additional events" in this item.

FAU_GEN.1.2-NIAP-0410 – The TSF shall record within each audit record at least the following information:

    a. date and time of the event, type of event, subject identity (if applicable), and the outcome (success or failure) of the event; and

    b. for each audit event type, based on the auditable event definitions of the functional components included in the PP/ST, [information specified in column three of Table 5.2 below].

    Application Note: In column 3 of the Table 5.2 below, "if applicable" is used to designate data that should be included in the audit record if it "makes sense" in the context of the event that generates the record. If no other information is required (other than that listed in "a") for a particular audit event type, then an assignment of "none" is acceptable.

Table 5.2 – Auditable Events

Requirement	Auditable Events	Additional Audit Record Contents
FAU_ARP.1	Potential security violation was detected	Identification of what caused the generation of the alarm
FAU_ARP_ACK_DIR_EXP.1	None	The identity of the administrator that acknowledged the alarm.
FAU_GEN.1-NIAP-0410	None	
FAU_GEN.2-NIAP-0410	None	
FAU_SAA.1-NIAP-0407	Enabling and disabling of any of the analysis mechanisms (i.e., changing the applicable rules)	The identity of the Security Administrator performing the function
FAU_SAR.1(1)	Opening the audit trail	The identity of the Audit Administrator performing the function
FAU_SAR.1(2)	Opening the audit trail	The identity of the Audit Administrator performing the function
FAU_SAR.2	Unsuccessful attempts to read information from the audit records	The identity of the administrator performing the function
FAU_SAR.3	None	
FAU_SEL.1-NIAP-0407	All modifications to the audit configuration that occur while the audit collection functions are operating	The identity of the Security Administrator performing the function
FAU_STG.1-NIAP-0429	None	
FAU_STG.3	Actions taken due to exceeding the audit threshold Fact that audit threshold was exceeded	Action taken Percentage of storage capacity that triggered warning The identity of the Security Administrator performing the function
FAU_STG.NIAP-0429-1	None	The identity of the Security Administrator performing the function
FCO_NRO_EXP.1	The invocation of the non-repudiation service When notification sent to Security Administrator that receipt acknowledgement was not received	Identity of the requestor that evidence of origin be generated, identification of the information, the destination, and a copy of the evidence provided.

Requirement	Auditable Events	Additional Audit Record Contents
FCO_NRR_EXP.1	The invocation of the non-repudiation service Acknowledgement was sent after information was received	Identity of the requestor that evidence of receipt be generated, identification of the information, the destination, and a copy of the evidence provided
FCS_BCM_EXP.1	None	
FCS_CKM.1	Failure of the activity	
FCS_CKM.4	None	
FCS_CKM_EXP.2	Success or Failure of the activity	
FCS_COP_EXP.2	Failure of cryptographic operation	Type of cryptographic operation Any applicable cryptographic mode(s) of operation, excluding any sensitive information
FCS_COP_EXP.3	Failure of cryptographic operation	Type of cryptographic operation Any applicable cryptographic mode(s) of operation, excluding any sensitive information
FCS_COP_EXP.5	Failure of cryptographic operation	Type of cryptographic operation Any applicable cryptographic mode(s) of operation, excluding any sensitive information
FCS_COP_EXP.6	Failure of cryptographic operation	Type of cryptographic operation Any applicable cryptographic mode(s) of operation, excluding any sensitive information
FDD_DAU_EXP.1	Requests to verify evidence of the validity of information	Identification of the information
FDD_RPL_EXP.1	Invocation of the replication mechanism	When TSF is the consumer: the IP address of the producer of the replica data and a reference to the unit of replication (e.g., the DN at the top of the subtree). When TSF is the producer: the IP address of the consumer of the replica data and a reference to the unit of replication (e.g., the DN at the top of the subtree).
FDP_ACC.2	None	
FDP_ACF.1	All requests to perform an operation on an object covered by the SFP	
FDP_RIP.2	None	

Requirement	Auditable Events	Additional Audit Record Contents
FIA_AFL.1-NIAP-0425	The reaching of the threshold for the unsuccessful authentication attempts The actions (e.g. disabling of an account) taken The subsequent, if appropriate, restoration to the normal state (e.g. re-enabling of an account)	Identity of the unsuccessfully authenticated user
FIA_ATD.1(1)	None	
FIA_ATD.1(2)	None	
FIA_ATD.1(3)	None	
FIA_UAU.1	Access to the Directory by an anonymous relying party	
FIA_UAU.2	Successful and unsuccessful use of authentication mechanisms	Claimed identity of the user using the authentication mechanism, and must exclude all password information in the audit record.
FIA_UAU.5	Successful and unsuccessful use of authentication mechanisms	Claimed identity of the user using the authentication mechanism, and must exclude all password information in the audit record.
FIA_UID.2	All use of the user identification mechanism	Claimed identity of the user using the identification mechanism, and must exclude all password information in the audit record.
FIA_USB.1-NIAP-0351	Success and failure of binding of user security attributes to a subject	The identity of the user whose attributes are attempting to be bound
FMT_MOF.1(*)	Enabling or Disabling a security function referenced in the associated FMT_MOF.1 components	The mechanism that was enabled/disabled The identity of the administrator performing the function
FMT_MSA.1	All manipulation of the security attributes by an administrator	The old and new values of the affected security attributes The identity of the administrator performing the function
FMT_MTD.1(*)	All modifications of the values of TSF data by an administrator	The old and new values of the affected TSF data The identity of the administrator performing the function

Requirement	Auditable Events	Additional Audit Record Contents
FMT_MTD.2(1)	All modifications of the limits on processor time	The old and new limits The identity of the administrator performing the function
FMT_MTD.2(2)	All modifications of the limits on transport-layer resources	The old and new limits The identity of the administrator performing the function
FMT_SMF.1	Use of the management functions	The identity of the administrator performing the function
FMT_SMR.2(*)	Modifications to the group of users that are part of a role	User IDs that are associated with the modifications, and the roles they were associated to or disassociated from The identity of the administrator performing the function
FPT_RCV.2-NIAP-0406	The fact that a failure or service discontinuity occurred Resumption of the regular operation	Type of failure or service discontinuity
FPT_RPL.1	Detect replay attack	Identity of the user that was the subject of the reply attack
FPT_RVM.1	None	
FPT_SEP.2-NIAP-0424	None	
FPT_STM.1	Changes to the time	The identity of the Administrator or Data Manager performing the function.
FPT_TDC.1(*)	None	
FPT_TST_EXP.4	Execution of TSF self tests and the results of the tests	The identity of the administrator performing the test, if initiated by an administrator.
FPT_TST_EXP.5	Execution of cryptomodule self tests and the results of the tests performed	The identity of the cryptographic administrator performing the test, if initiated by an administrator
FRU_RSA.1(*)	Fact that a quota was exceeded	The quota threshold that was exceeded
FTA_SSL.1	Locking of an interactive session by the session locking mechanism Any attempts at unlocking of an interactive session	The identity of the user associated with the session being locked or unlocked

Requirement	Auditable Events	Additional Audit Record Contents
FTA_SSL.2	Locking of an interactive session by the session locking mechanism Any attempts at unlocking of an interactive session	The identity of the user associated with the session being locked or unlocked
FTA_SSL.3(*)	The termination of a remote session by the session locking mechanism	The identity of the user associated with the session that was terminated
FTA_TAB.1	None	
FTA_TSE.1	All attempts at establishment of a user session	The identity of the user attempting to establish the session For unsuccessful attempts, the reason for denial of the establishment attempt
FTP_ITC.1(*)	All attempted uses of the trusted channel functions	Identification of the initiator and target of the trusted channel
FTP_TRP.1(*)	All attempted uses of the trusted path functions	Identification of the claimed user identity

FAU_GEN.2-NIAP-0410   User Identity Association

FAU_GEN.2.1-NIAP-0410 – The TSF shall be able to associate each auditable event with the identity of the user that caused the event.

Application Note: For failed login attempts no user association is required because the user is not under TSF control until after a successful identification/authentication.

FAU_SAA.1-NIAP-0407   Potential violation analysis

FAU_SAA.1.1-NIAP-0407 – The TSF shall be able to apply a set of rules in monitoring the audited events and based upon these rules indicate a potential violation of the TSP.

FAU_SAA.1.2-NIAP-0407 – **Refinement:** The TSF shall **monitor the** accumulation or combination of **the following events** known to indicate a potential security violation:

    a. [accumulation of [authentication failures as defined in FIA_AFL.1(1) and FIA_AFL.1(2)];

    b. accumulation of [a specified number of failed requests to access directory information within a specified time period].

    c. any detected replay of authentication information or relying party operations;

d.   any detected modification of information in a trusted channel;

e.   any failure of the cryptographic self-tests;

f.   any failure of the other TSF self-tests;

g.   any detection of possible audit data loss as defined in FAU_STG.3;

h.   accumulation of [cryptographic administrator-*specified number of encryption failures*];

i.   accumulation of [cryptographic administrator-*specified number of decryption failures*]; and

j.   [*selection: [ST assignment: any other rules], "no additional events"*]].

> *Application Note: The intent of this requirement is that an alarm is generated (FAU_ARP.1) once the threshold for an event is met. Once the alarm has been generated it is assumed that the "count" for that event is reset to zero.*
>
> *The failure of TSF self-tests in f) include failures of FPT_TST_EXP.4.1 and FPT_TST_EXP.5.1.*
>
> *Each of the lettered items above constitutes a "rule"; if the ST author wishes to specify greater functionality (for example, the triggering of multiple conditions above before an alarm is generated) the ST author should modify the assignment appropriately.*

FAU_SAR.1(1)   Audit review (Auditor Role)

FAU_SAR.1.1(1) – The TSF shall provide [the Auditor] with the capability to read [all audit data] from the audit records.

FAU_SAR.1.2(1) – **Refinement:** The TSF shall provide the audit records in a manner suitable for the **Auditor** to interpret the information.

> *Application Note: Supporting the objective to isolate administrative actions, this requirement specifies that only the auditor is allowed to view the audit records. Please see the rationale section for more detail.*
>
> *As specified in FAU_SAR.2, audit data is required to be available to two other security requirements. FAU_ARP_EXP.1.1 provides the security administrator with access to audit data information related to alarms, and FAU_SAR.1(2) provides audit data to an external intrusion detection system.*

FAU_SAR.1(2)   Audit review (External Audit Analysis)

FAU_SAR.1.1(2) – **Refinement:** The TSF shall provide [the Data Manager for audit information] with the capability to read [all audit information] from the audit records **via [ST assignment: mechanism TSF uses to provide the audit information to the Data Manager for audit information]**.

FAU_SAR.1.2(2) – The TSF shall provide the audit records in a manner suitable for the user to interpret the information.

> *Application Note: This requirement requires that the audit data be made available to a trusted external IT entity that is granted the Data Manager Role for reading the audit information by the security administrator as specified in FMT_MTD.1(4), e.g., an external Intrusion Detection System. The ST author should fill in the assignment with the actual method used to provide the information (e.g., writing to a file, storing in the directory, available through a network service).*

FAU_SAR.2   Restricted audit review

FAU_SAR.2.1 – **Refinement**: The TSF shall prohibit all users read access to the audit records **in the audit trail**, except the **Auditor and the Data Manager for audit information.**

> *Application Note: Audit data from the audit trail is restricted to the auditor to support isolating administrative actions, and to the data manager for audit information to support an external intrusion detection system. Also note FAU_ARP_EXP.1.1 provides the security administrator with access to audit data information related to alarms.*

FAU_SAR.3   Selectable audit review

FAU_SAR.3.1 – The TSF shall provide the ability to perform *searches and sorting* of audit data, based on:

    a. [user identity;

    b. role;

    c. event type, including non-repudiation activity, replication activity;

    d. range of one or more dates;

    e. range of one or more times;

    f. objects covered by the SFP(s);

    g. success of auditable security events;

    h. failure of auditable security events;

    i. [*selection: object identity, subject identity, host identity, "none"*], and

j. [*selection: [ST assignment: other criteria determined by the ST Author], no additional criteria*]].

Application Note: "User identity" applies to all users; see application note for FIA_UID.2. "event type" is to be defined by the ST author; the intent is to be able to include or exclude classes of audit events.

It is implied that the Auditor is the only user who can perform this function since they are the only users with read access to all of the audit records in the audit trail. While the Data manager for audit information, e.g., an intrusion detection system, has access to the audit records it would not depend on the TOE to perform such operations on its behalf.

Audit data should be capable of being searched and sorted on all criteria specified in a – j, if applicable (i.e., not all criteria will exist in all audit records). Sorting means to arrange the audit records such that they are "grouped" together for administrative review. For example the Auditor may want all the audit records for a specified user presented together to facilitate their audit review. If no additional criteria are provided by the TOE to perform searches or sorting of audit data, the ST author selects "no additional criteria".

FAU_SEL.1-NIAP-0407 Selective Audit

FAU_SEL.1.1-NIAP-0407 – **Refinement:** The TSF shall **allow only the Security Administrator** to include or exclude **at run-time** auditable events from the set of audited events based on the following attributes:

a. [user identity;

b. role,

c. event type, including non-repudiation activity, replication activity;

d. objects covered by the SFP(s);

e. success of auditable security events;

f. failure of auditable security events,

g. [*selection: object identity, subject identity, host identity, "none"*], and

h. [*selection: [ST assignment: list of additional criteria that audit selectivity is based upon], no additional criteria*]].

Application Note: "User identity" applies to all users; see application note for FIA_UID.2. "event type" is to be defined by the ST author; the intent is to be able to include or exclude classes of audit events.

FAU_STG.1-NIAP-0429 Protected audit trail storage

FAU_STG.1.1-NIAP-0429 – **Refinement:** The TSF shall restrict the deletion of stored audit records in the audit trail to the **Auditor**.

FAU_STG.1.2-NIAP-0429 – The TSF shall be able to *prevent* modifications to the audit records in the audit trail.

FAU_STG.3   Action in case of possible audit data loss

FAU_STG.3.1 – **Refinement:** The TSF shall [immediately alert the auditor and security administrator] if the audit trail exceeds [a security administrator-settable percentage of storage capacity].

> *Application Note: For the first assignment of "other actions as determined by the ST author", the ST Author should determine if there are other actions that should be taken when the audit trial setting is exceeded, and put these in the assignment. If there are no other actions, then "none" should be selected.*
>
> *This requirement ensures the auditor and security administrator are immediately alerted to the possibility of audit data loss, and works in concert with the assignments in FAU_ARP.1 and FAU_SAA.1-NIAP-0407 to further specify the requirements for this notification.*

FAU_STG.NIAP-0429-1   Site-configurable Prevention of audit data loss

FAU_STG.NIAP-0429-1.1 – **Refinement:** The TSF shall provide a **Security Administrator** with the capability to select one of the following actions [*prevent auditable events, except those taken* **by the authorised user with special rights**, *overwrite the oldest stored audit records* and [*selection*: [*ST assignment: other actions to be taken in case of audit storage failure*], *no additional options*] to be taken if the audit trail is full.

FAU_STG.NIAP-0429-1.2 – **Refinement:** The TSF shall **enforce the Security Administrator's selection(s)** if the audit trail is full.

> *Application Note: The TOE provides the Security Administrator the option of preventing audit data loss by preventing auditable events from occurring. The Security Administrator's actions under these circumstances are not required to be audited. The TOE also provides the Security Administrator the option of overwriting "old" audit records rather than preventing auditable events, which may protect against a denial-of-service attack. Note that this last capability technically conflicts with FAU_STG.1-NIAP-0429, which specifies that the TOE should restrict deletion to the Auditor. From the perspective of mitigating the threat that the audit trail is compromised, however, these two requirements do not conflict and can co-exist; see the rationale section for more detail.*
>
> *The ST author should fill in other technology-specific actions that can be taken for audit storage failure (in addition to the two already specified), or select "no additional options" if there are no such technology-specific actions.*

5.1.2 Class FCO: Communication

The following explicit requirements for non-repudiation include functions to support the Directories' role in a PKI to make RLs and certificates available according to their certificate policies. The requirements include both the generation and verification of

evidence for non-repudiation, including a timestamp, and notification that evidence of receipt the TOE is waiting for is overdue.

Explicit: Selective proof of origin for Directory Data (FCO_NRO_EXP.1)

FCO_NRO_EXP.1.1 – The TSF shall be able to generate evidence of origin for transmitted [Directory Information Base data] at the request of the [originator or recipient].

Application Note: The transmission of portions of the directory information base may be through the replication process defined in FDD_RPL_EXP.1 or through updates to the DIB from a data manager for a portion of the Directory Information Base.

FCO_NRO_EXP.1.2 – The TSF shall be able to relate the [identity] of the originator and time of receipt of the information, and the [all fields] of the information to which the evidence applies.

FCO_NRO_EXP.1.3 – The TSF shall provide a capability to verify the evidence of origin of information to [originator or recipient] given [an indefinite time period].

FCO_NRO_EXP.1.4 – The TSF shall be able to send notification [ST assignment: ST author defined mechanisms] to a Security Administrator if it does not receive receipt acknowledgement (see FCO_NRR.1.1) within a Security Administrator-specified time period for a [Security Administrator specified- [ST assignment: [set of operations]].

Explicit: Selective proof of receipt for Directory Data (FCO_NRR_EXP.1)

FCO_NRR_EXP.1.1 – **Refinement:** The TSF shall be able to generate evidence of receipt for received [Directory Information base data], and upon receipt send acknowledgement to originator, and at the request of the [originator or recipient].

FCO_NRR_EXP.1.2 – The TSF shall be able to relate the [identity] of the recipient and time of receipt of the information, and the [all fields] of the information to which the evidence applies.

FCO_NRR_EXP.1.3 – The TSF shall provide a capability to verify the evidence of receipt of information to [originator or recipient] given [an indefinite time period].

5.1.3 Class FCS: Cryptographic Support

The cryptographic requirements are structured to accommodate use of FIPS 140-2 validated cryptomodules in meeting the requirements. Since the FIPS 140-2 scheme does not cover all aspects of all algorithms, a convention is needed to distinguish the cryptographic functionality that the TSF is required to provide that cannot be provided by a FIPS-validated cryptographic module (e.g., Diffie-Hellman Key Agreement) from cryptographic functionality that can be provided via a FIPS-validated cryptomodule (e.g., AES). In the following text and requirements, "cryptomodule" is used in the very specific sense that it is

- *a module that is FIPS 140-2 validated (to comply with FCS_BCM_EXP.1 below);*
- *the cryptographic functionality implemented in that module are FIPS-approved security functions that have been validated; and*
- *the cryptographic functionality is available in a FIPS-approved mode for the cryptomodule.*

Further, when the requirements mandate that a FIPS-approved security function be used, it requires that that security function is implemented in a cryptomodule as defined above. Not all the requirements specify a cryptomodule, and more than one cryptographic component may be used in providing the cryptographic functionality.

It is the intent of these requirements (and the requirements are worded such) that whenever cryptographic functionality that can be FIPS-validated is required, that functionality be implemented in a cryptomodule. This means that when key management requirements (including key generation) are present, the key management functionality must be present in the cryptomodule. As an example, cryptomodules implementing AES must generate their own key.

FCS_COP_EXP.5 (Cryptographic Operation: Random Number Generation) is unusual because it is not a FIPS-approved security function as listed in Annex A to FIPS 140-2. However, its inclusion in the set of requirements mandates that whenever random number

generation is required by a cryptographic function (e.g., generation of symmetric key, generation of the private key of a public-private key pair) that it be implemented in a cryptomodule.

FCS_COP_EXP.6 (Cryptographic Operation: Cryptographic Hashing Function) is similar because it is used by many other cryptographic operations (e.g., digital signature generation and verification). As with RNGs, this requirement mandates that the hashing function used in the other cryptographic operations be implemented in a cryptomodule.

It is important to note to vendors and end users that any IT entity that is used to protect National Security Information, and employs cryptography as a protection mechanism, will require the TOE's key management techniques to be approved by NSA when the TOE is fielded.

FCS_BCM_EXP.1   Baseline Cryptographic Module

FCS_BCM_EXP.1.1 – All cryptographic modules shall be FIPS PUB 140-2 validated, and perform the specified cryptographic functions in a FIPS-approved mode of operation.

FCS_BCM_EXP.1.2 – All cryptographic modules implemented in the TSF shall have a minimum overall Security Level 1 and meet Security Level 3 for the following: cryptographic module ports and interfaces; roles, services and authentication; cryptographic key management, and design assurance, and Security Level 4 for self-tests.

FCS_CKM.1 Cryptographic Key Generation (for symmetric keys using RNG)

FCS_CKM.1.1 – **Refinement:** The **cryptomodule** shall generate **symmetric** cryptographic keys **using a FIPS-Approved Random Number Generator for all key sizes that meet one of the standards defined in Annex C to FIPS 140-2**.

> *Application Note: Annex C to FIPS 140-2 defines FIPS-Approved random number generation algorithms. Each of the algorithms is defined in an associated standard listed in the Annex. The actual key size will be determined by the algorithm that uses the key; see FCS_COP_EXP.2.*

FCS_CKM_EXP.2   Cryptographic Key Establishment

FCS_CKM_EXP.2.1 – The TSF shall provide the following cryptographic key establishment technique(s): [*selection:*

- *Cryptographic Key Establishment using Discrete Logarithm Key Agreement*

Application Note: This element of the top-level selection applies to automated key agreement schemes where an exchange occurs between the TOE and another IT entity that results in both entities having the same secret key without ever having passed that key between the two entities. This is in contrast to key transport schemes, where key is actually passed between two IT entities. This is also distinct from key loading, where the user is either directly inputting or receiving key, or an automated device (token, PC card, etc.) is inputting or receiving key.

- *The TSF shall provide the capability to act as the initiator or responder (that is, act as Party U or Party V as defined in the standard) to agree on cryptographic keys of all sizes using the [selection: dhStatic, dhEphem, dhOneFlow, dhHybrid1, dhHybrid2, dhHybridOneFlow, MQV1, MQV2] key agreement scheme where domain parameter p is a prime of [ST assignment: size of prime "p" in number of bits that is 3072 or greater] and domain parameter q is a prime of [ST assignment: size of prime "q" in number of bits that is 256 or greater], and that conforms with ANSI X9.42-2001, Public Key Cryptography for the Financial Services Industry: Agreement of Symmetric Keys Using Discrete Logarithm Cryptography.*

Application Note: It should be noted that the actual key size of the symmetric key agreed to when using this scheme will be a function of the algorithm that will be using the key, as specified in FCS_COP_EXP.2.

In the selection in paragraph a), one or more of the schemes should be chosen by the ST author, based on what schemes the TOE implements. Note that the requirement is for the TSF to be able to act as either party (as detailed in the standard) for the chosen scheme(s).

The two assignments are used to specify the number of bits used for the domain parameters p and q (which are primes). The requirement above indicates that p must be a prime of at least 3072 bits, while q must be a prime of at least 256 bits. The ST author should fill in the appropriate number of bits based on the implementation. This applies if the implementation generates its own domain parameters, or if it obtains the domain parameters in some other way (e.g., hard-coded, obtained from an outside authority).

- *The TSF shall conform to the standard using a FIPS-approved MAC function, a FIPS-approved Random Number generation function, and a FIPS-approved Hashing function.*
- *The choices and options used in conforming to the key agreement scheme(s) are as follows: [ST assignment: options that the TSF implements when implementing the selected key agreement schemes, including options for any prerequisite or dependant functions (e.g., domain parameter generation and validation.];*

Application Note: In the X9.42-2001 standard there are several sections that are marked "optional", or where a choice is given. Choices are, for example, how the domain parameters are obtained (generated or obtained from some other entity). Another example is the key derivation function that is implemented. ST authors should use the

assignment to provide sufficient information so that 1) it is possible to test the implementation of the function in a repeatable fashion, and 2) readers (consumers) of the ST understand exactly what is done by the key agreement schemes implemented. The ST author should ensure that all of the prerequisite options/choices, as well as choices/options in dependant functions, are covered in the assignment.

- *Cryptographic Key Establishment using Elliptic Curve Key Agreement*

Application Note: This element of the top-level selection applies to automated key agreement schemes where an exchange occurs between the TOE and another IT entity that results in both entities having the same secret key without ever having passed that key between the two entities. This is in contrast to key transport schemes, where key is actually passed between two IT entities. This is also distinct from key loading, where the user is either directly inputting or receiving key, or an automated device (token, PC card, etc.) is inputting or receiving key.

- *The TSF shall provide the capability to act as the initiator or responder (that is, act as Party U or Party V as defined in the standard) to agree on cryptographic keys of all sizes using the [selection: Ephemeral Unified Model, 1-Pass Diffie-Hellman, Static Unified Model, Combined Unified Model with Key Confirmation, 1-Pass Unified Model, Full Unified Model, Full Unified Model with Key Confirmation, Station-to-Station, 1-Pass MQV, Full MQV, Full MQV with Key Confirmation] key agreement scheme using Elliptic Curves with the order of the base point being a [ST assignment:* size of the order of the base point "n" in number of bits that is 256 or greater*]-bit value, and conforms to ANSI X9.63-2001, Public Key Cryptography for the Financial Services Industry: Key Agreement and Key Transport Elliptic Curve Cryptography.*

Application Note: It should be noted that the actual key size of the symmetric key agreed to when using this scheme will be a function of the algorithm that will be using the key, as specified in FCS_COP_EXP.2.

In the selection in paragraph a), one or more of the schemes should be chosen by the ST author, based on what schemes the TOE implements. Note that the requirement is for the TSF to be able to act as either party (as detailed in the standard) for the chosen scheme(s) where the schemes are asymmetric.

The assignment is used to specify the number of bits used for the domain parameter n, which is the order of the base point of the curve chosen (the standard uses "n" to denote this value). The requirement above indicates that n must be at least a 256-bit value. The ST author should fill in the appropriate number of bits based on the implementation. This applies if the implementation generates its own domain parameters, or if it obtains the domain parameters in some other way (e.g., hard-coded, obtained from an outside authority).

- *The TSF shall conform to the standard using a FIPS-approved MAC function, a FIPS-approved Random Number generation function, and a FIPS-approved Hashing function.*
- *The choices and options used in conforming to the key transport scheme(s) are as follows: [ST assignment: options that the TSF implements when implementing the selected key transport schemes, including options for any prerequisite or dependant functions (e.g., domain parameter generation and validation.];*

Application Note: In the X9.63-2001 standard there are several sections that are marked "optional", or where a choice is given. Choices are, for example, in the domain parameter generation and validation section (Section 5.1) where domain parameters can be generated over F_p or over F_{2^m}. Another example is the Diffie-Hellman primitive (Standard or Modified) that is implemented. ST authors should use the assignment to provide sufficient information so that 1) it is possible to test the implementation of the function in a repeatable fashion, and 2) readers (consumers) of the ST understand exactly what is done by the key agreement schemes implemented. The ST author should ensure that all of the prerequisite options/choices, as well as choices/options in dependant functions, are covered in the assignment.

- *Cryptographic Key Establishment using Key Transport*

Application Note: This element of the top-level selection applies to automated key transport schemes where key is exchanged between the TOE and another IT entity. This is in contrast to key agreement schemes, where key is determined based on shared public information between two IT entities. This is also distinct from key loading, where the user is either directly inputting or receiving key, or an automated device (token, PC card, etc.) is inputting or receiving key.

- *The TSF shall provide (act as the initiator) and accept (act as the responder) cryptographic keys to/from another IT Entity using the [selection: 1-Pass Transport Scheme; 3-Pass Transport Scheme; both the 1-Pass and 3-Pass Transport Schemes] using Elliptic Curves with the order of the base point being a [ST assignment: size of modulus "n" in number of bits that is 256 or greater]-bit value in a manner that conforms with ANSI X9.63-2001, Public Key Cryptography for the Financial Services Industry: Key Agreement and Key Transport Elliptic Curve Cryptography.*

Application Note: In the selection in paragraph a), one or more of the schemes should be chosen by the ST author, based on what schemes the TOE implements. Note that the requirement is for the TSF to be able to act as either party (as detailed in the standard) for the chosen scheme(s).

The assignment is used to specify the number of bits used for the domain parameter n, which is the order of the base point of the curve chosen (the standard uses "n" to denote this value). The requirement above indicates that n must be at least a 256-bit value. The ST author should fill in the appropriate number of bits based on the

implementation. This applies if the implementation generates its own domain parameters, or if it obtains the domain parameters in some other way (e.g., hard-coded, obtained from an outside authority).

- *The TSF shall conform to the standard using a FIPS-approved MAC function, a FIPS-approved Random Number generation function, and a FIPS-approved Hashing function.*
- *The choices and options used in conforming to the key transport scheme(s) are as follows: [ST assignment: options that the TSF implements when implementing the selected key transport schemes, including options for any prerequisite or dependant functions (e.g., domain parameter generation and validation.];*

Application Note: In the X9.63-2001 standard there are several sections that are marked "optional", or where a choice is given. Choices are, for example, in the domain parameter generation and validation section (Section 5.1) where domain parameters can be generated over F_p or over $F_2{}^m$. Another example is the Diffie-Hellman primitive (Standard or Modified) that is implemented. ST authors should use the assignment to provide sufficient information so that 1) it is possible to test the implementation of the function in a repeatable fashion, and 2) readers (consumers) of the ST understand exactly what is done by the key agreement schemes implemented. The ST author should ensure that all of the prerequisite options/choices, as well as choices/options in dependant functions, are covered in the assignment.

- *Cryptographic Key Establishment using Manual Loading*

*Application Note: This element of the top-level selection applies to the case where a human is either typing key into the TSF, or the TSF is outputting key to a display, for instance. The distinguishing feature is that the transaction is between a human and the TSF, and **not** between the TSF and another IT device or IT media.*

- *The cryptomodule shall [selection: be able to accept as input; be able to output in the following circumstances [ST assignment: circumstances under which the cryptomodule will output a key]] cryptographic keys in accordance with a specified manual cryptographic key distribution method using FIPS-approved Key Management techniques that meets the FIPS 140-2 Key Management Security Levels 3, Key Entry and Output;*

Application Note: The selection should be used by the ST author to indicate whether the cryptomodule is capable of accepting keys, capable of outputting keys, or both. In the case where the key is output, the ST author should use the assignment to detail the conditions under which key is output from the cryptomodule (for example, only during a certain type of key generation activity).

Note that this requirement mandates that cryptomodules in the TSF have the ability to perform manual key input/output, and that this capability has been through the FIPS validation process.

- *Cryptographic Key Establishment using Automated Loading*

Application Note: This element of the top-level selection applies to automated key loading device. In the case where key is being transferred from the device to the TSF the key is being "input". In the case where the key is being transferred from the TSF to the device (for instance, a CA loading a user's private key into a token device) the key is being "output."

- *The cryptomodule shall [selection: be able to accept as input; be able to output in the following circumstances* [ST assignment: circumstances under which the cryptomodule will output a key*]] cryptographic keys in accordance with a specified electronic cryptographic key distribution method using FIPS-approved Key Management techniques that meet the following: [*

Application Note: The selection should be used by the ST author to indicate whether the cryptomodule is capable of accepting key, capable of outputting key, or both. In the case where the key is output, the ST author should use the assignment to detail the conditions under which key is output from the cryptomodule (for example, only during a certain type of key generation activity).

- *The electronic device is directly attached by [selection: internal bus, serial port, USB port, audio device, assignment: [*other non-network physical device*]] to the TSF;*

Application note: An example of a device attached by an internal bus would be a floppy device used for keys transported on floppy disks.

- *The TSF shall perform key error detection scheme on keys input via electronic methods using [selection:* parity check, *[ST assignment:* other key error detection scheme*]]; and*

Application Note: The ST author should indicate what error detection scheme is employed. The requirement above refers to errors in parity or structure of the key; it does not necessarily require checks on key "goodness", length, format, etc.

- *FIPS 140-2 Key Management Security Levels 3, Key Entry and Output.]].*

Application Note: Note that this requirement mandates that cryptomodules in the TSF have the ability to perform automated key input/output, and that this capability has been through the FIPS validation process.

The ST author selects one or more of the identified methods (i.e., the two key agreement schemes, key transport, manual loading or automated loading) used to establish cryptographic keys in the TOE.

FCS_CKM.4 Cryptographic Key Destruction

FCS_CKM.4.1 – **Refinement:** The TSF shall destroy cryptographic keys in accordance with a cryptographic **key zeroization method** that meets the following:

a. [The Key Zeroization Requirements in FIPS PUB 140-2 Key Management Security Levels 3;

b. Zeroization of all private cryptographic keys, plaintext cryptographic keys and all other critical cryptographic security parameters shall be immediate and complete; and

c. The zeroization shall be executed by overwriting the key/critical cryptographic security parameter storage area three or more times with an alternating pattern.

d. The TSF shall overwrite each intermediate storage area for private cryptographic keys, plaintext cryptographic keys, and all other critical security parameters three or more times with an alternating pattern upon the transfer of the key/CSPs to another location].

Application note: Item d applies to locations that are used when the keys/parameters are copied during processing, and not to the locations that are used for storage of the keys, which are specified in items b and c. The temporary locations could include memory registers, physical memory locations, and even page files and memory dumps.

Explicit: Cryptographic Operation (Encryption/Decryption using AES) (FCS_COP_EXP.2)

FCS_COP_EXP.2.1 – A cryptomodule shall perform encryption and decryption using the FIPS-Approved Security Function AES algorithm operating in [*selection: one or more of ECB, CBC, OFB, CFB1, CFB8, CFB128, CTR]* mode(s) supporting key sizes of *[selection: one or more of 128 bits, 192 bits, 256 bits]*.

Application Note: The ST should select (in the first selection) the modes in which the cryptomodule operates in the TOE. Note that these modes must be available in the FIPS-approved operation mode of the cryptomodule.

In the second selection, the key size or sizes supported by the cryptomodule when using this function need to be selected. Note that requirements for key generation and key establishment are given in previous components.

Explicit: Cryptographic Operation (Digital Signature Generation/Verification) (FCS_COP_EXP.3)

FCS_COP_EXP.3.1 – A cryptomodule shall perform digital signature generation and verification using the FIPS-Approved Security Function [*selection:*

- *RDSA*

Application Note: This top-level selection indicates that the digital signatures will be calculated using the rDSA algorithm specified in X9.31-1998, as implemented in a FIPS-validated cryptomodule.

- *The cryptomodule shall implement rDSA with a modulus size of [ST assignment: size of modulus "n" in number of bits that is 2048 bits or greater] in a manner that conforms to ANSI X9.31-1998, Digital Signatures Using Reversible Public Key Cryptography for the Financial Services Industry (rDSA).*

Application Note: The ST author should fill in the assignment with the number of bits the module uses for its modulii. Note that in order to meet the requirement modulii must be at least 2048 bits.

- *The choices and options used in conforming to the X9.31-1998 are as follows: [ST assignment: options that the TSF implements when implementing the signature generation and validation functions, including options for any prerequisite or dependant functions (e.g., key generation)];*

Application Note: In the X9.31-1998 standard there are several sections that are marked "optional", or where a choice is given. For instance, the public verification exponent "e" can be fixed or randomly generated. Another instance is that the procedure in section 4.1.2.1 can be followed to generate the primes p and q, or another procedure followed as long as the primes generated meet the conditions in section 4.1.2. The goal of the assignment is to provide sufficient information such that 1) it is possible to test the implementation of the function in a repeatable fashion, and 2) readers (consumers) of the ST understand exactly what is done by the rDSA implementation. The ST author should ensure that all of the prerequisite options/choices, as well as choices/options in dependant functions, are covered in the assignment.

- *ECDSA*

Application Note: This top-level selection indicates that the digital signatures will be calculated using the ECDSA algorithm specified in X9.62-1998, as implemented in a FIPS-validated cryptomodule.

- *The cryptomodule shall implement ECDSA where the order of the base point is a [ST assignment: size of the order of the base point "n" in number of bits that is 256 or greater]-bit value, and where the algorithm conforms with ANSI X9.62-1998, Public Key Cryptography for the Financial Services Industry: The Elliptic Curve Digital Signature Algorithm (ECDSA).*

Application Note: The assignment is used to specify the number of bits used for the domain parameter n, which is the order of the base point of the curve chosen (the standard uses "n" to denote this value). The requirement above indicates that n must be at least a 256-bit value. The ST author should fill in the appropriate number of bits based on the implementation. This applies if the implementation generates its own domain parameters, or if it obtains the domain parameters in some other way (e.g., hard-coded, obtained from an outside authority).

- *The choices and options used in conforming to X9.62-1998 are as follows: [ST assignment: options that the TSF implements when implementing the signature generation and validation functions, including options for any prerequisite or dependant functions (e.g., domain parameter generation and validation).]].*

Application Note: In the X9.62-1998 standard there are several sections that are marked "optional", or where a choice is given. Choices are, for example, in the domain parameter generation and validation section (Section 5.1) where domain parameters can be generated over F_p or over F_2^m. Public Key validation is an example of an optional part of the standard. ST authors should use the assignment to provide sufficient information such that 1) it is possible to test the implementation of the function in a repeatable fashion, and 2) readers (consumers) of the ST understand exactly what is done by the key transport schemes implemented. The ST author should ensure that all of the prerequisite options/choices, as well as choices/options in dependant functions, are covered in the assignment.

Explicit: Cryptographic Operation (Random Number Generation) (FCS_COP_EXP.5)

FCS_COP_EXP.5.1 – The TSF shall perform all Random Number Generation used by the cryptographic functionality of the TSF using a FIPS-approved Random Number Generator implemented in a FIPS-approved cryptomodule running in a FIPS-approved mode.

Application Note: Whenever a referenced standard calls for a random number generation capability, this requirement specifies the subset of random number generators (those that are FIPS-validated) that are acceptable. Note that the RNG

does not have to be implemented in the cryptomodule that is performing the cryptographic operation. Also note that this requirement is not calling for the RNG functionality to be made generally available (e.g., to untrusted users via an API).

Explicit: Cryptographic Operation (Cryptographic Hashing Function) (FCS_COP_EXP.6)

FCS_COP_EXP.6 – The TSF shall perform all Cryptographic Hashing Functions used by other cryptographic functionality of the TSF using a FIPS-approved Cryptographic Hashing Function implemented in a FIPS-approved cryptomodule running in a FIPS-approved mode.

> *Application Note: Whenever a referenced standard calls for a cryptographic hashing capability (e.g., SHA-1), this requirement specifies the subset of cryptographic hashing functions (those that are FIPS-validated) that are acceptable. Note that the hashing function does not have to be implemented in the cryptomodule that is performing the cryptographic operation. Also note that this requirement is not calling for the hashing functionality to be made generally available (e.g., to untrusted users via an API).*

5.1.4 Class FDD: Directory Functions

Explicit: Verifiable Journal of Updates (FDD_DAU_EXP.1)

> *Application Note: To provide relying parties and data managers a means to validate the source and integrity of the information in its repository, directories provide verifiable 'journals of updates' (i.e., journals) for entries in its Directory Information Base (DIB). Each DIB entry has its own journal that comprises a set of records (i.e., journal entries) that document each change to that DIB entry. To ensure integrity of the information each record of change within a journal is digitally signed, and the journal is digitally signed. An example of a mechanism to provide this service is described in draft-ietf-ldapext-sigops-03.txt, however compliance to this mechanism is not required by the PP.*

FDD_DAU_EXP.1.1 – The TSF shall be able to generate a 'journal of updates', i.e., journal, to security administrator-specified DIB entries that records all the updates to the DIB entry, from the creation of the entry, its initial value, and through deletion of the entry, where each record in a journal includes:

    a.   identity of the data manager performing the update operation;

    b.   date and time of the update;

    c.   the entry data provided by data manager in the update operation;

    d.   [*selection: [ST assignment: other defined by ST Author]" none"*].

FDD_DAU_EXP.1.2 – The TSF shall ensure each record in a journal has a cryptographic signature from either

    a.   the data manager updating the DIB entry with a signed operation or

    b.   the TSF generates the signature for the record.

> *Application Note: The cryptographic signature used by the TSF can be the digital signature algorithms specified in FCS_COP_EXP.3, ensuring the strength of the mechanism is commensurate with medium robustness requirements. If an implementation uses another cryptographic algorithm, it's expected that the ST author will include this algorithm as another FCS_COP requirement with enough information to enable a comparison of its strength and applicability to support this security function.*

FDD_DAU_EXP.1.3 – The TSF shall use a cryptographic signature to provide evidence that can be used as a guarantee of the validity of the journal for each DIB entry.

> *Application Note: The cryptographic signature used by the TSF can be the digital signature algorithms specified in FCS_COP_EXP.3, ensuring the strength of the mechanism is commensurate with medium robustness requirements. If an implementation uses another cryptographic algorithm, it's expected that the ST author will include this algorithm as another FCS_COP requirement with enough*

information to enable a comparison of its strength and applicability to support this security function.

FDD_DAU_EXP1.4 – The TSF shall ensure the following access control is applied to each journal:

    a. the journal is included in the replica data when its associated DIB entry is replica data;

    b. the same read access rights are granted to the journal as its associated DIB entry;

    c. once a journal has been established it is protected from modification and deletion.

Application Note: In addition to creating the journal the TOE provides a means for its retrieval by relying parties and data managers, and therefore must provide controlled access to the journal and must ensure it's included in replica data. Since the journal records include the contents of the updates, the journal must be subject to the same read access control restrictions as its associated DIB entry. However, inherent to its purpose, only the TSF may modify or delete the journal.

This explicit component is necessary to specify a unique requirement for a directory service that is not addressed by the CC. The requirement includes elements of FAU_GEN.1 and FDP_DAU.1, and elements unique to this security service.

Explicit: Replication of directory data with security attributes (FDD_RPL_EXP.1)

Application Note: This component requires a replication function to increase the availability of the Directory's DIB data within a system. A Directory provides access to information, including authentication information such as certificates and RLs. By replicating DIB information to other directories and receiving replicated DIB information in a manner that ensures the integrity of the data and its associated security attributes, the availability of the data for the system is increased.

The terms supplier and consumer are used to identify the source and destination of replication updates, respectively. A supplier Directory sends updates to a consumer directory, and a consumer directory accepts those updates. The TOE includes both consumer and producer functions. The configuration information for replication is referred to as the replication agreement, specified in FMT_MTD.1(1).

This explicit component is necessary to specify a unique requirement for a directory service that is not addressed by the CC. The requirement incorporates elements of FDP_ITC.2, FDP_ETC.2, FPT_TDC.1, and elements unique to this security service.

FDD_RPL_EXP.1.1 – The TSF shall support a replication mechanism for exporting and importing [security administrator-defined replica data] to Security Administrator-specified Peer Trusted Directories assigned as Data Managers.

FDD_RPL_EXP.1.2 – The TSF shall export and import the data with the data's associated security attributes including both ACI entries and DACD entries.

FDD_RPL_EXP.1.3 – The TSF shall ensure that the security attributes, when exported outside the TSC, are unambiguously associated with the exported data.

FDD_RPL_EXP.1.4 – The TSF shall ensure that the security attributes, when imported from outside the TSC, are unambiguously associated with the imported data.

FDD_RPL_EXP.1.5 – The TSF shall provide the capability to consistently interpret the security attributes associated with the data.

> *Application Note: As stated earlier, the access control requirements FDP_ACC and FDP_ACF are consistent with current industry Directory standards efforts to ensure that the directory information data that is replicated may consistently support a security policy. The ST author when describing the replication function should identify the mechanisms used to enforce consistency, e.g., compliance with a replication standard.*

5.1.5 Class FDP: User Data Protection

The access control requirements FDP_ACC and FDP_ACF specify requirements that are consistent with current industry Directory standards efforts to ensure that the directory information data that is replicated consistently enforce a security policy. ST authors are required to specify in FDD_RPL_EXP.1 how the product ensures the policy can be propagated.

 The access control decision is based on processing the access rights defined by the Access Control Information (ACI) items in the Directory. Each ACI item associates protected items and user classes with permissions. Rather than each protected object having its own access control list or set of permissions, the directory has a set of ACI items for all its data where each ACI item grants or denies permissions in regard to a set of specified users and protected items. The scope of the protected items can be a single entry or a collection of entries, resulting in an access control decision for a single request being based on multiple ACIs.

Access control decisions are a two-step process. First the Directory compiles all the ACIs associated with a requested operation, by including all ACIs where the requestor identity is among the set of specified users or the target object is among the set of protected items of the ACI. Then the Directory applies the access control rules to these ACIs. The algorithm that defines this two-step process is referred to as the Access Control Decision Function (ACDF). FDP_ACF.1 specifies the rules required for the ACDF of a compliant Directory. The ACDF must be deterministic and the ST author is required to specify the algorithm(s) in the assignments below.

FDP_ACC.2 Complete access control

> *Application Note: While multiple access control policies are allowed, compliant TOEs are only required to implement one access control policy and therefore only one is*

specified in the PP, Directory Basic Access Control (BAC). Current industry Directory standards efforts also include a simplified version of BAC referred to Simplified Access Control (SAC), and a policy to support labels and Mandatory Access Control, referred to as Rule-based Access Control (RBAC). SAC is a functional subset of BAC and therefore it is not included in the requirements. RBAC not required for compliant TOEs.

For TOEs with multiple access control policies, an ST author should iterate the FDP_ACC.1 and FDP_ACF.1. In addition, if an ST author wants to include support for multiple policies operating concurrently on its Directory Information, the ST author must identify in FDP_ACF.1.2 how the TOE knows which policy to apply.

FDP_ACC.2.1 – The TSF shall enforce the [Directory Basic Access Control SFP] on

    d. [Subjects: Data Manager, Relying Party;

    e. Objects: DIB entry, DIB attribute type, DIB attribute value, [*selection: [ST assignment: [other directory objects], "none"*];

    f. and all operations among subjects and objects covered by the SFP].

FDP_ACC.2.2 – The TSF shall ensure that all operations between any subject in the TSC and any object within the TSC are covered by an access control SFP.

Application Note: In the first selection, the ST author should identify other objects on which access control is applied, and make appropriate changes to FDP_ACF.1(1) to reflect this addition. If no other objects are supported the ST author should select "none".

FDP_ACF.1   Security attribute based access control [Directory Basic Access Control SFP]

FDP_ACF.1.1 – The TSF shall enforce the [Directory Basic Access Control SFP] to objects based on

- [Subject security attributes:
  - [Distinguished Name,
  - User Group,
  - Role,
  - Authentication level,
  - [*selection: [ST assignment: other], "none"*]];

Application Note: Authentication level refers to how the subject authenticated to the directory: anonymously, with a password, or with a certificate.

It's CC convention that the requested operation is an implicit subject attribute.

Access control decisions based on a subject's domain may be implemented with the User Group attribute.

In an implementation the role may be defined by the method by which the user accesses the TOE, as opposed to an explicit "attribute" maintained by the TSF by the user.

Access control decisions are based on a users identity via distinguished name attribute. Through this requirement an implementation may prevent access from anonymous users and an ST author may want to describe any features that facilitates this in an access control policy.

- Object security attributes:
    - ° [Access control information (ACI) item(s) each specifying the following:
        - ➢ objects for which the ACI applies,
        - ➢ subjects for which the ACI applies,
        - ➢ priority of the ACI,
        - ➢ access allowed or denied,
        - ➢ Authentication level required,
        - ➢ [*selection: [ST assignment: other], "none"*]]*;*
    - ° Directory Access Control Domain(s) (DACD)].

Application Note: The access control policy allows the directory information to be grouped into arbitrary overlapping collections of entries referred to as 'Directory Access Control Domains' to which ACIs can be defined that apply to all the entries within the domain. For example, an access control domain could be made for each of the following groups of entries: all employees, some level of management, network management applications etc., and different ACIs can be assigned to each of them.

The following provides a mapping between the terminology used for the PP and X.500 terminology:

- objects for which the ACI applies = 'Protected Items',
- subjects for which the ACI applies = 'User Classes' ,
- priority of the ACI = 'Precedence', and
- access allowed or denied = 'Permissions for operations'.

FDP_ACF.1.2 – The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed: [

a. *the set of all 'associated ACIs' must be considered.*

- *the set of all 'associated ACIs' must include both ACIs assigned to the requested object and to the object's DACD.*

- *the set of all 'associated ACIs' must include ACIs where:*

    - ° *the subject requestor (distinguished name, user group, role) is authenticated at the required level and is in the ACI subject's set;*

    - ° *the protected object of the operation is in the ACI objects set;*

- ° *[selection: [ST assignment: other, e.g., scope of influence when the TOE supports multiple concurrent access control policies], "none"];*
  - *the set of all 'associated ACIs' are established using the following algorithm [ST Assignment: algorithm].*

b. *the access control decision must apply the following rules to the 'associated ACIs':*

- *only ACIs with the highest priority are considered;*

- *if precedence are equal then use only the ACIs with the most specific subjects are considered;*

- *if priority and most specific subject are equal then use only the ACIs with the most specific objects are considered;*

- *grant access only if all access control decision ACIs grant access, i.e., if there are no ACIs, or at least one of them denies access, then access is denied.*

- *[selection: [ST assignment: other], "none"];*

c. *the access control decision is made using the following algorithm [ST Assignment: algorithm]].*

FDP_ACF.1.3 – The TSF shall explicitly authorize access of subjects to objects based on the following additional rules:

a. [ST assignment: additional rules, based on security attributes that explicitly grant access of subjects to objects].

FDP_ACF.1.4 – The TSF shall explicitly deny access of subjects to objects based on the following additional rules:

a. [Relying parties are denied all access expect read access;

Application Note: The ST author should explicitly state in the TSS how this requirement would be met, e.g., using standard ACIs, it's hard coded, etc.

b. [ST assignment: additional rules, based on security attributes, that explicitly deny access of subjects to objects]].

FDP_RIP.2 Full residual information protection

FDP_RIP.2.1 – The TSF shall ensure that any previous information content of a resource is made unavailable upon the *[selection: allocation of the resource to, deallocation of the resource from]* all objects.

5.1.6 Class FIA: Identification and Authentication

TOE security functions implemented by a probabilistic or permutational mechanism (e.g., password or hash function) are required (at EAL2 and higher) to include a strength of function claim. Strength of Function shall be demonstrated for the non-certificate based authentication mechanisms to be SOF-medium, as defined in Part 1 of the CC. Specifically, the local authentication mechanism must demonstrate adequate protection against attackers possessing a moderate attack potential.

FIA_AFL.1-NIAP-0425   Authentication failure handling

FIA_AFL.1.1-NIAP-0425 – **Refinement:** The TSF shall detect when *a Security Administrator-configurable integer* **of** unsuccessful authentication attempts occur related to [Security Administrator attempts to authenticate remotely, and all Auditor, Crypto Administrator, Data Manager, and relying party authentication attempts].

> *Application Note: This requirement does not apply to Security administrator local authentication attempts, since it does not make sense to lock a local security administrator's account in this fashion. This could be addressed by requiring a separate account for local security administrators, which would be stated in the administrative guidance, or the TOE's authentication mechanism implementation could distinguish login attempts that are made locally and remotely.*

FIA_AFL.1.2-NIAP-0425 – When the defined number of unsuccessful authentication attempts has been met or surpassed, the TSF shall [prevent the remote security administrator, Data Managers, and relying parties from performing activities that require authentication until an action is taken by the Security Administrator].

> *Application Note: If a product has multiple mechanisms controlled by different administrators e.g., authentication to the platform vs. authentication to the Directory, then the ST author should iterate this component as appropriate for their product.*

FIA_ATD.1(1)   User attribute definition (Relying Party without a certificate, including anonymous access)

FIA_ATD.1.1(1) – **Refinement:** The TSF shall maintain the following list of security attributes belonging to **relying parities without certificates and anonymous relying parties** :

    a. [user identifier;

    b. role;

    c. type of authentication;

    d. user group;

e. [*selection: [ST assignment: other attributes for a user as defined by the ST author], "none"*]].

Application Note: The ST author should be more specific with respect to the user identifier if possible. For example, GDS requires that the EDI_PI be employed to uniquely identify individuals, organizations, devices, and locations, so the ST author might choose to use "EDI_PI" instead of "user identifier" in "a" above.

In an implementation the role may be defined by the method by which the user accesses the TOE, as opposed to an explicit "attribute" maintained by the TSF by the user.

For anonymous relying parties, the TOE will "fill in" the attributes based on those applicable for anonymous access to the TOE.

"Type of authentication" is used to indicate which authentication method is to be used for the user if the TOE supports multiple authentication mechanisms, and also may be used in access control decisions (e.g., a user logging on with a password may access a subset of the objects accessible to users logging on using a certificate).

FIA_ATD.1(2)   User   attribute   definition   (Remote   Administrator, Remote Data Manager, and Relying Party with a certificate)

FIA_ATD.1.1(2) – **Refinement:** The TSF shall maintain the following list of security attributes belonging to **remote administrators, remote data managers, and relying parties with certificates**:

a. [user identifier;

b. role;

c. type of authentication;

d. X.509 public key certificate;

e. user group;

f. [*selection: [ST assignment: attributes associated with certificates], "none"*];

g. [*selection: [ST assignment: other attributes for a user as defined by the ST author] "none"*]].

Application Note: In addition to humans, this type of user could also be a trusted IT entity that performs some administrative function on the directory.

The ST author should be more specific with respect to the user identifier if possible. For example, GDS requires that the EDI_PI be employed to uniquely identify individuals, organizations, devices, and locations, so the ST author might choose to use "EDI_PI" instead of "user identifier" in "a" above. Similarly for a trusted IT entity the identifier may be the IP address and port.

In an implementation the role may be defined by the method by which the user accesses the TOE, as opposed to an explicit "attribute" maintained by the TSF by the user.

"Type of authentication" is used to indicate which authentication method is to be used for the user if the TOE supports multiple authentication mechanisms, and also

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may be used in access control decisions (e.g., a user logging on with a password may access a subset of the objects accessible to users logging on using a certificate).

In "f", the ST author should identify certificates (e.g., "attribute certificates") that are used by the TOE in making security decisions. If no certificates other than X.509 public key certificates are used, the ST author should select "none".

FIA_ATD.1(3) User attribute definition (Local Administrator)

FIA_ATD.1.1(3) – **Refinement**: The TSF shall maintain the following list of security attributes belonging to **local administrators**:

a. [user identifier(s);

b. role;

c. [*selection: [ST assignment: other attributes for a user as defined by the ST author], "none"*]].

Application Note: In addition to humans, this type of user could also be a trusted IT entity that performs some administrative function on the platform.

In an implementation the role may be defined by the method by which the user accesses the TOE, as opposed to an explicit "attribute" maintained by the TSF for the user.

This iteration of the FIA_ATD component should be used by ST authors to capture the attributes for parts of the TOE (other than the directory application) that require administrative access (for example, the Operating System on which the directory application runs). While certificate-based authentication for platform administrators is not required by this PP, if a platform implements a certificate-based mechanism the ST author should specify this attributes similar to those in FIA_ATD.1(2) in element "c" of this component.

FIA_UAU.1 Timing of authentication (anonymous Relying Party)

FIA_UAU.1.1 – **Refinement:** The TSF shall allow [access to directory information base objects in accordance with the defined access control policy for anonymous users] on behalf of **anonymous relying parties** to be performed before the user is authenticated.

FIA_UAU.1.2 – The TSF shall require each user to be successfully authenticated before allowing any other TSF-mediated actions on behalf of that user.

FIA_UAU.2 User authentication before any action

FIA_UAU.2.1 – **Refinement**: The TSF shall require each **Administrator, Data Manager, and authenticated Relying Party** to be successfully authenticated before allowing any other TSF-mediated actions on behalf of that user.

FIA_UAU.5 Multiple authentication mechanisms

FIA_UAU.5.1 – **Refinement:** The TSF shall provide

    a. [password,

    b. one-way certificate-based,

    c. two-way certificate-based

    d. third-party introduction (for chained requests),

    e. third-party credential presentation (for chained requests),

    f. [ST assignment: other authentication mechanisms]]

to **provide** user authentication.

FIA_UAU.5.2 – The TSF shall authenticate any user's claimed identity according to the following rules:

    a. [[*selection: [ST assignment: local administrator(s) and local data managers as defined by the ST author], "none"*] shall use the password mechanism.

    b. non-anonymous Relying Party authenticating without a certificate shall use the password mechanism;

    c. remote Administrator and Remote Data Manager shall use either one-way or two-way certificate-based authentication as specified by the security administrator, and as described in FCS_COP_EXP.3;

    d. relying Party with a certificate shall use the one-way certificate-based authentication as described in FCS_COP_EXP.3;

    e. a Relying Party may be considered authenticated by third-party introduction from a Data Manager that used certificate-based authentication (item c above) and is trusted to perform third-party introduction for chained requests;

    f. a Relying Party may use password or certificated-based authentication mechanism (items a and b above) when its credentials are presented by a Data Manager that used certificate-based authentication (item c above) and is trusted to perform third-party credential presentation for chained requests;

    g. [*selection: [ST assignment: other rules as defined by the ST author], "none"*]].

    Application Note: For the first selection in element FIA_UAU.5.2, the ST author should fill in the assignment for the administrators and data managers, (e.g., cryptographic administrator, security administrator) which use passwords to authenticate when they access the TOE locally. If they use another mechanism (e.g., certificates), then "none" should be selected and if necessary, the appropriate assignment be made in item "g".

    Authentication mechanisms to support chaining are required. There are two authentication mechanisms for a relying party used in the chaining process that ensure the access control policies apply to these requests: "3rd party introduction" and "3rd party presentation". In addition to these, the trusted peer directory (i.e., the data manager for chaining) must be authenticated with a certificate-based mechanism. 3rd Party Introduction trusts that the peer directory correctly verified the authentication credentials of the relying party before passing the chained request to

the TOE. 3rd Party Presentation trusts that the peer directory ensured the integrity and, if necessary, the confidentiality of the authentication credentials passed to the TOE as part of the chained request.

FIA_UID.2   User identification before any action

FIA_UID.2.1 – The TSF shall require each user to identify itself before allowing any other TSF-mediated actions on behalf of that user.

Application Note: This component applies to all users (administrators, and relying parties). Because of the nature of connections to the directory, even anonymous relying parties are identified (as "anonymous") prior to performing any actions on the TOE.

FIA_USB.1-NIAP-0351   User-Subject Binding

FIA_USB.1.1-NIAP-0351 – **Refinement:** The TSF shall associate **all user security attributes** with subjects acting on behalf of that user.

5.1.7 Class FMT: Security management

This protection profile requires support for two kinds of trusted users: administrators and data managers. There are a minimum of three administrators: Security Administrator, Cryptographic Administrator, and Auditor, and there are multiple data managers. The Security Administrator is for general security administrative responsibilities, and it's anticipated that a compliant implementation may refine and iterate this role as necessary to support component parts of the TOE, e.g., a Directory Administrator and a Platform Administrator.   Data managers are specific users granted access to a set of trusted data by a security administrator. There may be multiple users who assume a data manager role, e.g., a CA updating directory data, and a time synchronization system.

In this protection profile the FMT_MOF family is only used to restrict the ability to enable or disable certain security functions. All other restrictions on actions with respect to security functions are specified through FMT_MTD, because these actions all are performed through management of TSF data.

FMT_MOF.1(1)   Management of security functions behaviour (Directory Functions)

FMT_MOF.1.1(1) – The TSF shall restrict the ability to *enable, disable* the functions:

    a.   [Security Alarms (FAU_ARP.1);

    b.   Replication of Directory Data (FDD_RPL_EXT.1);

    c.   Creating Journal of Updates (FDD_DAU_EXP.1);

    d.   relying party operation replay detection mechanism (FPT_RPL.1(2))]

to [the Security Administrator].

> *Application Note: This requirement ensures only the Security Administrator can enable or disable (turn on or turn off) the alarm notification function. As currently written, FAU_ARP.1 does not lend itself to behavior modification. If the ST author were to include additional functionality in FAU_ARP.1 (e.g., notify the administrator via a pager) then the ST author should consider using FMT_MTD for this requirement.*

FMT_MOF.1(2)   Management   of   security   functions   behaviour (Cryptographic Module Testing)

FMT_MOF.1.1(2) – The TSF shall restrict the ability to *enable, disable* the functions:

    a. [cryptomodule testing after key generation (FPT_TST_EXP.5)]

to [the Cryptographic Administrator].

FMT_MSA.1 Management of security attributes [directory basic access control attributes]

FMT_MSA.1.1 – The TSF shall enforce the [Directory Basic Access Control SFP] to restrict the ability to *change_default, query, modify, delete,* [*selection: [ST assignment: [other attribute operations], "none"*]] the security attributes [in the referenced policy] to [the Security Administrator, Data Manager].

FMT_MTD.1(1)   Management of TSF data (Administration of Security Functions)

FMT_MTD.1.1 – The TSF shall restrict the ability to [*selection: change_default, query, modify, delete, clear, query, modify* [ST assignment*: other operations*]] the [TSF data listed below, and all other TSF data except data explicitly mentioned in other iterations of FMT_MTD.1:

- TSF data required to manage the non-repudiation functions:
  - ° Generate evidence of origin (FCO_NRO);
  - ° Timeframe for receipt of acknowledgement (FCO_NRO);
  - ° Generate evidence of receipt (FCC_NRR);
  - ° Sent acknowledgement of receipt (FCO_NRR);
- TSF data required to manage the Identification and authentication functions:
  - ° Authentication failure handling (FIA_AFL);
  - ° Authentication Mechanisms and Rules for Authentication (FIA_UAU);
  - ° Chaining Authentication methods: 3rd Party Introduction and 3rd Party Presentation (FIA_UAU);
- Anonymous user access including any security administrator defined default subject security attribute for these anonymous users (FIA_UAU and FIA_USB)

    Application Note: Management of the Chaining authentication methods requires that only a security administrator may define which methods (i.e., 3rd party introduction or 3rd party presentation) may be allowed for trusted peer directories.

    Regarding anonymous user access, it is expected that ST authors will provide a description of how anonymous access may be disabled in their TOE summary specification section.

- TSF data required to manage the session locking and session establishment functions:

- ° Session Locking of local interactive session (FTA_SSL.1);
- ° Session Locking of Remote Administration Session (FTA_SSL.3(1));
- Session locking of Remote directory service session (FTA_SSL.3(2))
- Session Establishment conditions (FTA_TSE.1)
- TSF data required to manage the Audit and Alarm functions:
    - ° maintenance of the users with read access to the audit records (auditor and data manager for audit information (FAU_SAR.1(2));
    - ° maintenance of the rules by (adding, modifying, deletion) of rules from the set of rules (FAU_SAA.1-NIAP-0407);
- TSF self-tests (FPT_TST_EXP.4);
- Automated and Manual recovery from a failure or service discontinuity (FPT_RCV);
- Managing the group of users that are part of a role (FMT_SMR.2);
- Maintenance of banner message (FTA_TAB.1);
- Managing the replication agreements (FDD_RPL_EXP.1);
- Specifying the actions to be taken when the TSF data is at or exceeds the limits defined for FMT_MTD.2*]

to [the Security Administrator].

> *Application Note: If multiple administrators are used to implement the security administrator role, the ST author should iterate this component refine the security administrator role assignment appropriately. The last item, TSF data maintained inside or outside Directory Information Base, is used as a catch-all to ensure access is secure. Management of sets of this data can be delegated to a data manager in FMT_MTD.1(4)*

FMT_MTD.1(2)   Management of TSF data (cryptographic TSF data)

FMT_MTD.1.1(2) – The TSF shall restrict the ability to *modify, query, and clear* the [cryptographic security data] to [the Cryptographic Administrator].

> *Application Note: The intent of this requirement is to restrict the ability to configure the TOE's cryptographic policy to the Cryptographic Administrator. Configuring the cryptographic policy is related to things such as: setting modes of operation, key lifetimes, selecting a specific algorithm, and key length.*

FMT_MTD.1(3)   Management of TSF data (time TSF data)

FMT_MTD.1.1(3) – The TSF shall restrict the ability to *set* the [time and date used to form the time stamps in FPT_STM.1] to [the Security Administrator and Authorized Data Manager].

Application Note: The access granted to an authorized data manager is to provide a means for a Trusted External IT entity to synchronize the TOE's time with an external time source, e.g., an external NTP server.

The ability to query the directory information base is not included in this requirement so relying parties can read certificates and RLs.

FMT_MTD.1(4)   Management of TSF data (Subsets of TSF data)

FMT_MTD.1.1(4) – **Refinement:** The TSF shall restrict the ability to [*selection: create, query, modify, delete, clear, [selection: [ST assignment: other operations], "none"]*] [sets of TSF data defined by a security administrator] to [a data manager].

Application Note: The intent of this requirement is to allow the security administrator to define a sub-hierarchy of the directory to which a data manager has (essentially) administrative access. This can include creating a sub-hierarchy, modifying a sub-hierarchy, and having access to certain information (e.g., certificate-related data) in this sub-hierarchy. ST authors should iterate or refine this requirement to reflect the capabilities of the particular TOE.

FMT_MTD.2(1)   Management of limits on TSF data (processor time percentage)

FMT_MTD.2.1(1) – The TSF shall restrict the specification of the limits for [the percentage of processor time used by a relying party, and the time period over which this percentage is calculated] to [the Security Administrator].

FMT_MTD.2.2(1) – The TSF shall take the following actions, if the TSF data are at, or exceed, the indicated limits: [ST assignment: actions to be taken].

Application Note: The ST author should specify the actions that the TOE takes when quota is reached. For example, if the processor time is being consumed for a very large search on behalf of the relying party, the search may be terminated by the TSF. This requirement applies to the quotas specified by FRU_RSA.1(1). Note that if these actions are configurable by the administrator, the ST author should modify the audit requirements because of the CC Audit note for FMT_MTD.2.2 at the basic level.

FMT_MTD.2(2)   Management of limits on TSF data (transport-layer quotas)

FMT_MTD.2.1(2) – The TSF shall restrict the specification of the limits for [quotas on transport-layer connections] to [the Security Administrator].

FMT_MTD.2.2(2) – The TSF shall take the following actions, if the TSF data are at, or exceed, the indicated limits: [ST assignment: actions to be taken].

Application Note: The ST author should specify the actions that the TOE takes when quota is reached. For the TCP SYN attack, for example, the action might be to drop the oldest "n" half-open connections. Note that if these actions are configurable by the administrator, the ST author should modify the audit requirements because of the CC Audit note for FMT_MTD.2.2 is at the basic level.

FMT_SMF.1 Specification of Management Functions

FMT_SMF.1.1 The TSF shall be capable of performing the following security management functions: [backup and recovery, and archival of audit data].

FMT_SMR.2(1) Restrictions on security roles (strict separation)

FMT_SMR.2.1(1) – The TSF shall maintain the roles:

a. [Security Administrator,

b. Auditor,

c. Cryptographic Administrator,

d. [*selection: [ST assignment: additional authorised identified roles requiring strict separation], "none"*]].

Application Note: If multiple administrators are used to implement the 'security administrator' role, the ST author should refine the security administrator role and modify the relevant assignments appropriately ensuring the O.ADMIN_ROLES object is satisfied.

FMT_SMR.2.2(1) – The TSF shall be able to associate users with roles.

FMT_SMR.2.3(1) – **Refinement:** The TSF shall ensure the **following** conditions are satisfied:

a. [a user may act in only one role at a time without re-authenticating to a new role;

b. all roles are distinct; that is, there shall be no overlap of operations performed by each role;

c. all roles shall be able to administer the TOE locally;

d. all roles shall be able to administer the TOE remotely; and

e. [*selection: [ST assignment: additional conditions for the different roles], "none"*]].

Application Notes: In the first bullet of FMT_SMR.2.3(1), the intent is to allow a single user to fill multiple roles, but not at the same time. Note that this means that if the TOE uses the "user group" mechanism to implement roles, they have to ensure that only one group representing a role is "active" at a time, and that changing the "active" group to a new role-representing group requires the user to re-authenticate.

The second bullet indicates that the functions available to the role must not overlap. While it is true that a platform administrator may be able to indirectly affect directory functions (by directly editing a platform file containing directory policy information), this goes beyond what is required to counter the threat (see rationale section). The intent is that the interface presented to the role (and described in the AGD_ADM documentation) is unique with respect to the presented functionality for each role.

In the selection for SMR.2.3(1), the ST author should fill in the assignment for any additional conditions the TOE places on the roles, or select "none" if there are no additional conditions.

FMT_SMR.2(2)   Restrictions on security roles (data administration and users)

FMT_SMR.2.1(2) – The TSF shall maintain the roles:

a. [Data Manager;

b. Relying Party; and

c. [*selection: [ST assignment: additional authorised identified roles], "none"*]].

> *Application Note: It's expected that multiple data managers will be used to implement the data manager role, the ST author should refine the data manager role and modify the relevant assignments appropriately.*

FMT_SMR.2.2(2) – The TSF shall be able to associate users with roles.

FMT_SMR.2.3(2) – **Refinement:** The TSF shall ensure the **following** conditions are satisfied:

a. [a user may act in only one role at a time without re-authenticating to a new role;

b. each data manager must have a user identity associated with a security administrator-specified set of trusted data for which they have access.

c. data managers shall be able to access the TOE locally;

d. all roles shall be able to access the TOE remotely; and

e. [*selection: [ST assignment: additional conditions for the different roles], "none"*]].

> *Application Notes: As was the case with the first iteration of this component, in the first bullet of FMT_SMR.2.3(2) the intent is to allow a single user to fill multiple roles, but not at the same time.*
>
> *The distinction between this iteration and the previous iteration is that this iteration does not require the functions of the two roles to be distinct. This is because the intent is that a directory manager would be responsible for only a part of the directory hierarchy, and their access (scope of control) is determined by the directory administrator (see FMT_MTD.1(5)). So, they would be allowed to perform*

some of the same functions as the directory administrator, but their scope of control would be less than the entire directory.

In the selection for SMR.2.3(2), the ST author should fill in the assignment for any additional conditions the TOE places on the roles, or select "none" if there are no additional conditions.

5.1.8 Class FPT: Protection of the TOE Security Functions

FPT_ITA.1   Inter-TSF availability within a defined availability metric

FPT_ITA.1.1 The TSF shall ensure the availability of [certificates and RLs] provided to a remote trusted IT product within [an security administrator-configurable time, and at a minimum 20 seconds] given the following conditions [ST assignment: *conditions to ensure availability*].

FPT_RCV.2-NIAP-0406   Recovery from failure

FPT_RCV.2.1-NIAP-0406 – For [*selection: [ST assignment: list of failures/service discontinuities], "no failures/service discontinuities"*], the TSF shall ensure the return of the TOE to a secure state using automated procedures.

FPT_RCV.2.2-NIAP-0406 – When automated recovery from a failure or service discontinuity is not possible, the TSF shall enter a maintenance mode where the ability to return the TOE to a secure state is provided.

FPT_RPL.1   Replay detection

FPT_RPL.1.1 – The TSF shall detect replay for the following entities [remote authentication information].

FPT_RPL.1.2 – The TSF shall

    a. [reject data;

    b. audit event; and

    c. [ST assignment: list of specific actions]]

when replay is detected.

FPT_RVM.1 Non-bypassability of the TSP

FPT_RVM.1.1 – The TSF shall ensure that TSP enforcement functions are invoked and succeed before each function within the TSC is allowed to proceed.

FPT_SEP.2-NIAP-0424   SFP domain separation

FPT_SEP.2.1-NIAP-0424 – The unisolated portion of the TSF shall maintain a security domain for its own execution that protects it from interference and tampering by untrusted subjects.

FPT_SEP.2.2-NIAP-0424 – The TSF shall enforce separation between the security domains of subjects in the TSC.

FPT_SEP.2.3-NIAP-0424 – **Refinement:** The TSF shall maintain the part of the TSF related to [**cryptography**] in **an address space for its** own execution that protects it from interference and tampering by the remainder of the TSF and by subjects untrusted with respect to the **cryptography module**.

> *Application Note: The address space protection would be only for accidental interference (e.g., coding errors) but not from any malicious part of the kernel. It does protect against malicious untrusted subjects. Off board hardware or a third processor hardware state is a preferred implementation, because it would protect the cryptography from all other parts of the TSF.*

FPT_STM.1   Reliable time stamps

FPT_STM.1.1 – The TSF shall be able to provide reliable time stamps for its own use.

FPT_TDC.1(1)   Inter-TSF basic TSF data consistency [Directory Time for certificate-based security mechanisms and non-repudiation services]

FPT_TDC.1.1(1) – The TSF shall provide the capability to consistently interpret [time stamps used by the directory portions of the TSF] when shared between the TSF and another trusted IT product.

FPT_TDC.1.2(1) – The TSF shall use [UTC time format] when interpreting the TSF data from another trusted IT product.

> *Application Note: Synchronized and consistent interpretation of time is required for certificate-based mechanisms to accurately process the validity time of the certificate. The TOE requires a certificate-based mechanism for authentication (FIA_UAU.5), and a verifiable journal of updates (FDD_DAU_EXP.1). The TOE also requires non-repudiation services that depend on synchronized time (FCO_NRO_EXP.1 and FCO_NRR_EXP.1).*

FPT_TDC.1(2)   Inter-TSF basic TSF data consistency [Distinguished Name Character Support]

FPT_TDC.1.1(2) – The TSF shall provide the capability to consistently interpret [Distinguished Names used by the directory portions of the TSF] when shared between the TSF and another trusted IT product.

FPT_TDC.1.2(2) – **Refinement:** The TSF shall **support the following list of characters:**

   a.   [upper and lower case standard English language alphabetic characters;

   b.   digits (0 - 9);

   c.   spaces; and

   d.   the following punctuation and special characters: @ # & * ( ) - \ ; : ' " , . /]

when interpreting the TSF data from another trusted IT product.

Explicit: TSF testing (FPT_TST_EXP.4)

FPT_TST_EXP.4.1 – The TSF shall run a suite of self-tests during initial start-up, periodically during normal operation as specified by the security administrator, and at the request of a security administrator to demonstrate the correct operation of the hardware portions of the TSF.

FPT_TST_EXP.4.2 – The TSF shall provide the *Security Administrator* with the capability to use a TSF-provided cryptographic function to verify the integrity of all TSF data except the following: audit data, [*selection: [ST assignment: other dynamic TSF data for which no integrity validation is justified*], *none*],].

FPT_TST_EXP.4.3 – The TSF shall provide the security administrator with the capability to use a TSF-provided cryptographic function to verify the integrity of stored TSF executable code.

> *Application Note: In element 4.1, only the hardware portions of the TSF need to be self-tested; this makes sense because hardware has the capability of degrading or failing over time, while software generally doesn't. TSF software integrity is addressed by element 4.3.*
>
> *In element 4.2, the ST author should specify the TSF data for which integrity validation is not required. While some TSF data are dynamic and therefore not amenable to integrity verification, it is expected that all TSF data for which integrity verification "makes sense" be subject to this requirement.*
>
> *In elements 4.2 and 4.3, the cryptographic mechanism can be any one of the ones specified in FCS_COP, although typically MAC or hash functions are used for integrity verification.*

Explicit: Cryptographic testing (FPT_TST_EXP.5)

FPT_TST_EXP.5.1 – The TSF shall run the suite of self-tests provided by the FIPS 140-2 cryptomodule during initial start-up (power on), at the request of the Cryptographic Administrator, periodically (at a Crypto Administrator-specified interval not less than at least once a day) to demonstrate the correct operation of the cryptographic components of the TSF.

FPT_TST_EXP.5.2 – The TSF shall be able to run the suite of self-tests provided by the FIPS 140-2 cryptomodule immediately after the generation of a key.

> *Application Note: For element 5.2, the Crypto Administrator has the ability to enable and disable this capability; this is specified in FMT_MOF.1(2).*

5.1.9 Class FRU: Resource Utilisation

FRU_RSA.1(1)   Maximum quotas (processor time)

FRU_RSA.1.1(1) – **Refinement:**   The   TSF   shall   enforce   **Security Administrator-specified** maximum quotas of the following resources: *processor*

time that a Relying Party and [*selection: [ST assignment: group of users], none*] *individual users* can use *over a specified period of time.*

FRU_RSA.1(2)   Maximum quotas (transport–layer)

FRU_RSA.1.1(2) – **Refinement:**   The TSF shall enforce **Security Administrator-specified** maximum quotas of the following resources: *transport-layer representation that individual users* can use *simultaneously*.

> *Application Note: "Transport-layer representation" refers specifically to the TCP SYN attack, where half-open connections are established thus exhausting the connection table resource.   If the TOE does not implement the TCP/IP protocol, this requirement would apply to a similar type of transport-layer entity for that TOE's protocol stack.*

5.1.10 Class FTA: TOE Access

FTA_SSL.1   TSF-initiated session locking

FTA_SSL.1.1 – The TSF shall lock a local interactive session after [a Security Administrator-specified time period of inactivity] by:

a. clearing or overwriting display devices, making the current contents unreadable.

b. disabling any activity of the user's data access/display devices other than unlocking the session.

FTA_SSL.1.2 – **Refinement:** The TSF shall require the **user to re-authenticate** prior to unlocking the session**.**

> *Application Note: A configurable expiry time for the bind token is an example implementation for this requirement.*

FTA_SSL.2   User-initiated locking

FTA_SSL.2.1 – The TSF shall allow user-initiated locking of the user's own local interactive session by:

   a. clearing or overwriting display devices, making the current contents unreadable.

   b. disabling any activity of the user's data access/display devices other than unlocking the session.

FTA_SSL.2.2 – **Refinement:** The TSF shall require the **user to re-authenticate** prior to unlocking the session.

> *Application Note: The interactive sessions in FTA_SSL.1 and FTA_SSL.2 are those of the local administrator. Non-administrators only have remote access to the TOE and the requirements for session locking levied on them are specified in FTA_SSL.3.*

FTA_SSL.3(1)   TSF-initiated   termination   (remote   administration session)

FTA_SSL.3.1(1) – **Refinement:** The TSF shall terminate a **remote administration** session after a [Security Administrator-configurable time interval of session inactivity].

> *Application Note: Remote administration sessions include all access by the administrators and the trusted external IT entities granted access by the security administrator.*

FTA_SSL.3(2)   TSF-initiated   termination   (remote   directory   service session)

FTA_SSL.3.1(2) – **Refinement:** The TSF shall terminate a **remote directory services** session after a [Security Administrator-configurable time interval of session inactivity].

> *Application Note: Remote directory service sessions include all access by relying parties, and Data Managers (users and trusted external IT entities) authorized by the Security Administrator to manage directory data. This component is listed separately from the remote administration iteration to require separate control for the different types of sessions.*

FTA_TAB.1   Default TOE access banners

FTA_TAB.1.1 – **Refinement:** Before establishing **an administrative** session the TSF shall display **only a Security Administrator-specified** advisory **notice and consent** warning message regarding unauthorized use of the TOE.

> *Application Note: The access banner applies only when an administrator begins an interactive session with the TOE. The intent of this requirement is to advise users of warnings regarding the unauthorized use of the TOE and to provide the Security Administrator with control over what is displayed (e.g., if the Security Administrator chooses, they can remove banner information that informs administrators of the product and version number).*

FTA_TSE.1   TOE session establishment

FTA_TSE.1.1 – The TSF shall be able to deny session establishment based on [location, time, and day].

> *Application Note: "Location" can refer to the network domain that the user (e.g., relying party) originates from. It should be noted that this requirement applies to both relying parties and administrators of the TSF. Also note that there may be two types of "sessions" for a TOE: one type for administration (e.g., a security administrator "logs on" to the platform, thus establishing a session) and one type for directory services, (e.g., a directory manager or a relying party binds to the directory, thus establishing a session).*

5.1.11 Class FTP: Trusted path/channels

FTP_ITC.1(1)   Inter-TSF trusted channel (Prevention of Disclosure)

FTP_ITC.1.1(1) – **Refinement:** The TSF shall **use encryption to** provide **a trusted** communication channel between itself and a **trusted external IT entity** that is logically distinct from other communication channels and provides assured identification of its end points and protection of the channel data from disclosure.

> *Application Note: Since a symmetric algorithm is required, the symmetric key will either have to be generated (FCS_CKM.1) or otherwise established (FCS_CKM_EXP.2). The ST may wish to include an application note indicating what mechanism(s) are used for keying the algorithm used to provide the above functionality.*

FTP_ITC.1.2(1) – The TSF shall permit *the TSF, or remote trusted IT product* to initiate communication via the trusted channel.

> *Application Note: The encryption used to protect the communication channel from disclosure is the symmetric algorithm specified in FCS_COP_EXP.2.*
>
> *The encryption used to protect the communication channel from disclosure can encryption/decryption specified in FCS_COP_EXP.2, ensuring the strength of the*

mechanism is commensurate with medium robustness requirements. If an implementation uses another cryptographic algorithm, it's expected that the ST author will include this algorithm as another FCS_COP requirement with enough information to enable a comparison of its strength and applicability to support this security function.

FTP_ITC.1.2(1) is used to ensure secure communications between the TOE and an external trusted IT entity (e.g., Peer TOE, Peer Directory, time synchronization system). While these trusted IT entities may initiate communications, it may be the case that the TOE is required to perform a "pull" operation (e.g., obtaining time from a time server).

FTP_ITC.1.3(1) – **Refinement: The trusted channel** shall **be used for [all password-based authentication functions, replication operations, remote management of directory service data, and [***selection:** [ST assignment: list of other functions for which a trusted channel is required], none*]].

Application Note: The "other functions" are the services that are provided by the trusted IT entities (e.g., time server, intrusion detection system access). If the ST author wishes to specify the function for which trusted channel is initiated by the TSF vs. the trusted IT entities, then this requirement should be iterated.

FTP_ITC.1(2)   Inter-TSF trusted channel (Detection of Modification)

FTP_ITC.1.1(2) – **Refinement:** The TSF shall **use a cryptographic signature to** provide **a trusted** communication channel **between itself and trusted external IT entity** that is logically distinct from other communication channels and provides assured identification of its end points and **detection of the modification of data**.

FTP_ITC.1.2(2) – The TSF shall permit *the TSF, or the trusted external IT entity* to initiate communication via the trusted channel.

Application Note: The encryption used to detect modification in a communication channel can be a digital signature/verification algorithm specified in FCS_COP_EXP.3, ensuring the strength of the mechanism is commensurate with medium robustness requirements. If an implementation uses another cryptographic algorithm, it's expected that the ST author will include this algorithm as another FCS_COP requirement with enough information to enable a comparison of its strength and applicability to support this security function.

FTP_ITC.1.2(2) is used to ensure secure communications between the TOE and an external trusted IT entity (e.g., Peer TOE, Peer Directory, time synchronization system). While these trusted IT entities may initiate communications, it may be the case that the TOE is required to perform a "pull" operation (e.g., obtaining time from a time server).

FTP_ITC.1.3(2) – **Refinement: The trusted channel** shall be used **for [all password-based authentication functions, replication operations, remote**

management of directory service data, and [*selection: [ST assignment: list of other functions for which a trusted channel is required], none*]].

> *Application Note: The "other functions" are the services that are provided by the trusted IT entities (e.g., time server, intrusion detection system access). If the ST author wishes to specify the function for which trusted channel is initiated by the TSF vs. the trusted IT entities, then this requirement should be iterated.*

FTP_TRP.1(1)   Trusted path (Prevention of Disclosure)

FTP_TRP.1.1(1) – **Refinement:** The TSF shall provide **an encrypted** communication path between itself and a *remote administrator and relying party authenticating with a password* that is logically distinct from other communication paths and provides assured identification of its end points and protection of the communicated data from disclosure.

FTP_TRP.1.2(1) – The TSF shall permit a *remote administrator and relying party authenticating with a password* to initiate communication via the trusted path.

FTP_TRP.1.3(1) – The TSF shall require the use of the trusted path for *relying party password-based authentication,* all remote administration actions, [*selection: [ST assignment: other services for which trusted path is required], "none"*].

> *Application Note: The encryption used to protect the communication channel from disclosure can encryption/decryption specified in FCS_COP_EXP.2, ensuring the strength of the mechanism is commensurate with medium robustness requirements. If an implementation uses another cryptographic algorithm, it's expected that the ST author will include this algorithm as another FCS_COP requirement with enough information to enable a comparison of its strength and applicability to support this security function.*
>
> *"all remote administration actions" means that the entire remote administration session is protected with the trusted path; that is, the administrator is assured of communicating with the TOE and the data passing between the administrator and the TOE are protected from disclosure.*

FTP_TRP.1(2)   Trusted path (Detection of Modification)

FTP_TRP.1.1(2) – **Refinement:** The TSF shall **use a cryptographic signature to provide a trusted** communication path between itself and a *remote administrator and relying party authenticating with a password* that is logically distinct from other communication paths and provides assured identification of its end points and **detection of the modification of data**.

FTP_TRP.1.2(2) – The TSF shall permit a *remote administrator and relying party authenticating with a password* to initiate communication via the trusted path.

FTP_TRP.1.3(2) – The TSF shall require the use of the trusted path for *relying party password-based authentication*, all remote administration actions, [*selection: [ST assignment: other services for which trusted path is required], "none"*].

> *Application Note: The encryption used to detect modification in a communication channel can be a digital signature/verification algorithm specified in FCS_COP_EXP.3, ensuring the strength of the mechanism is commensurate with medium robustness requirements. If an implementation uses another cryptographic algorithm, it's expected that the ST author will include this algorithm as another FCS_COP requirement with enough information to enable a comparison of its strength and applicability to support this security function.*
>
> *"all remote administration actions" means that the entire remote administration session is protected with the trusted path; that is, the administrator is assured of communicating with the TOE and the TOE provides a means for detecting the modification of data that flows through the protected communication path.*

5.2 SECURITY REQUIREMENTS FOR THE IT ENVIRONMENT

This Protection Profile provides functional requirements for the IT Environment. The IT environment includes trusted external IT entities (e.g., peer trusted directories, time synchronization server) and any IT entities that are used by administrators to remotely administer the TOE. These requirements consist of functional components from Part 2 of the CC.

FTP_ITC.1(1)   Inter-TSF trusted channel (Prevention of Disclosure)

FTP_ITC.1.1(1) – **Refinement:** The **IT Environment** shall **use encryption to** provide **a trusted** communication channel between itself **and the TSF** that is logically distinct from other communication channels and provides assured identification of its end points and protection of the channel data from disclosure.

FTP_ITC.1.2(1) – The TSF shall permit *the TSF or the IT environment* to initiate communication via the trusted channel.

FTP_ITC.1.3(1) – **Refinement:** The trusted channel **shall be used** for [all password-based authentication functions, replication operations, remote management of directory service data, and [*selection: [ST assignment: list of other functions for which a trusted channel is required], "none"*]].

FTP_ITC.1(2)   Inter-TSF trusted channel (Detection of Modification)

FTP_ITC.1.1(2) – **Refinement:** The **IT Environment** shall **use a cryptographic signature to** provide **a trusted** communication channel between itself **and the TSF** that is logically distinct from other communication channels and provides assured identification of its end points and **detection of the modification of data**.

FTP_ITC.1.2(2) – **Refinement:** The TSF shall permit *the TSF*, or **the IT Environment** to initiate communication via the trusted channel.

FTP_ITC.1.3(2) – **Refinement:** The trusted channel **shall be used** for [all relying party password-based authentication functions, replication operations, remote management of directory service data, and [*selection: [ST assignment: list of other functions for which a trusted channel is required], "none"*].

> *Application Note: The FTP_ITC.1(*) requirements are levied on the IT environment to ensure that the necessary support exists in the IT environment to communicate securely with the TOE. The FCS family of requirements have not been explicitly stated in the IT environment requirements, since the cryptographic algorithms and key sizes are implicitly required by the IT environment in order to communicate with the TOE.*

FTP_TRP.1(1)   Trusted path (Prevention of Disclosure)

FTP_TRP.1.1(1) – **Refinement:** The **IT Environment** shall provide **an encrypted** communication path between itself and **the TSF** that is logically

distinct from other communication paths and provides assured identification of its end points and protection of the communicated data from disclosure.

FTP_TRP.1.2(1) – **Refinement:** The **IT Environment** shall permit *remote users of the TSF* to initiate communication **to the TSF** via the trusted path.

FTP_TRP.1.3(1) – **Refinement**: The **IT Environment** shall **initiate** the use of the trusted path for *relying party password-based authentication, all remote administration actions*, [*selection: [ST assignment: other services for which trusted path is required] "none"*].

> *Application Note: This requirement is levied on the IT environment to ensure that the necessary support exists in the IT environment to communicate securely with the TOE. The FCS family of requirements have not been explicitly stated in the IT environment requirements, since the cryptographic algorithms and key sizes are implicitly required by the IT environment in order to communicate with the TOE.*

FTP_TRP.1(2)   Trusted path (Detection of Modification)

FTP_TRP.1.1(2) – **Refinement:** The **IT Environment** shall **use a cryptographic signature to** provide **a trusted** communication path between itself and **the TSF** that is logically distinct from other communication paths and provides assured identification of its end points and **detection of the modification of data**.

FTP_TRP.1.2(2) – The **IT Environment** shall permit *remote users **of the TSF*** to initiate communication **to the TSF** via the trusted path.

FTP_TRP.1.3(2) – **Refinement:** The **IT Environment** shall **initiate** the use of the trusted path for *relying party password-based authentication, all remote administration actions*, [*selection: [ST assignment: other services for which trusted path is required] "none"*].

> *Application Note: The FTP_TRP.1(*) requirements are levied on the IT environment to ensure that the necessary support exists in the IT environment to communicate securely with the TOE. The FCS family of requirements have not been explicitly stated in the IT environment requirements, since the cryptographic algorithms and key sizes are implicitly required by the IT environment in order to communicate with the TOE.*

5.3 TOE SECURITY ASSURANCE REQUIREMENTS

The TOE assurance requirements for this PP are EAL4 augmented several requirements bolded in the table below. All assurance requirements are summarized in the table below.

Table 5.3 – Assurance Requirements: EAL4 Augmented

Assurance Class	Assurance Components	
Configuration management	ACM_AUT.1	Partial CM automation
	ACM_CAP.4	Generation support and acceptance procedures
	ACM_SCP.2	Problem tracking CM coverage
Delivery and operation	ADO_DEL.2	Detection of modification
	ADO_IGS.1	Installation, generation, and start-up procedures
Development	ADV_FSP.2	Fully defined external interfaces
	ADV_HLD.2	Security enforcing high-level design
	ADV_INT.1	**Modularity**
	ADV_IMP.2	**Implementation of the TSF**
	ADV_LLD.1	Descriptive low-level design
	ADV_RCR.1	Informal correspondence demonstration
Guidance documents	ADV_SPM.1	Informal TOE security policy model
	AGD_ADM.1	Administrator guidance
	AGD_USR.1	User guidance
	ALC_DVS.1	Identification of security measures
Life cycle support	**ALC_FLR.2**	**Flaw Reporting Procedures**
	ALC_LCD.1	Developer defined life-cycle model
	ALC_TAT.1	Well-defined development tools

Assurance Class	Assurance Components	
Maintenance of Assurance	AMA_AMP.1	Assurance maintenance plan
Maintenance of Assurance	AMA_CAT.1	TOE component categorization report
	AMA_EVD.1	Evidence of assurance maintenance
	AMA_SIA.1	Security impact analysis
Tests	ATE_COV.2	Analysis of coverage
	ATE_DPT.2	Testing: low-level design
	ATE_FUN.1	Functional testing
	ATE_IND.2	Independent testing - sample
Vulnerability assessment	**AVA_CCA_EXP.2**	**Systematic cryptographic module covert channel analysis**
	AVA_MSU.2	Validation of analysis
	AVA_SOF.1	Strength of TOE security function evaluation
	AVA_VLA.3	**Moderately resistance**

ACM_AUT.1 Partial CM automation

Developer action elements:

ACM_AUT.1.1D - The developer shall use a CM system.
ACM_AUT.1.2D - The developer shall provide a CM plan.

Content and presentation of evidence elements:

ACM_AUT.1.1C - The CM system shall provide an automated means by which only authorized changes are made to the TOE implementation representation.
ACM_AUT.1.2C - The CM system shall provide an automated means to support the generation of the TOE.
ACM_AUT.1.3C - The CM plan shall describe the automated tools used in the CM system.
ACM_AUT.1.4C - The CM plan shall describe how the automated tools are used in the CM system.

Evaluator action elements:

ACM_AUT.1.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ACM_CAP.4 Generation support and acceptance procedures

Developer action elements:

ACM_CAP.4.1D - The developer shall provide a reference for the TOE.
ACM_CAP.4.2D - The developer shall use a CM system.
ACM_CAP.4.3D - The developer shall provide CM documentation.

Content and presentation of evidence elements:

ACM_CAP.4.1C - The reference for the TOE shall be unique to each version of the TOE.
ACM_CAP.4.2C - The TOE shall be labeled with its reference.
ACM_CAP.4.3C - The CM documentation shall include a configuration list, a CM plan, and an acceptance plan.
ACM_CAP.4.4C - The configuration list shall describe the configuration items that comprise the TOE.
ACM_CAP.4.5C - The CM documentation shall describe the method used to uniquely identify the configuration items.
ACM_CAP.4.6C - The CM system shall uniquely identify all configuration items.
ACM_CAP.4.7C - The CM plan shall describe how the CM system is used.
ACM_CAP.4.8C - The evidence shall demonstrate that the CM system is operating in accordance with the CM plan.
ACM_CAP.4.9C - The CM documentation shall provide evidence that all configuration items have been and are being effectively maintained under the CM system.
ACM_CAP.4.10C - The CM system shall provide measures such that only authorized changes are made to the configuration items.
ACM_CAP.4.11C - The CM system shall support the generation of the TOE.
ACM_CAP.4.12C - The acceptance plan shall describe the procedures used to accept modified or newly created configuration items as part of the TOE.

Evaluator action elements:

ACM_CAP.4.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ACM_SCP.2 Problem tracking CM coverage

Developer action elements:

ACM_SCP.2.1D - The developer shall provide CM documentation.

Content and presentation of evidence elements:

ACM_SCP.2.1C - The CM documentation shall show that the CM system, as a minimum, tracks the following: the TOE implementation representation, design

documentation, test documentation, user documentation, administrator documentation, CM documentation, and security flaws.

ACM_SCP.2.2C - The CM documentation shall describe how configuration items are tracked by the CM system.

Evaluator action elements:

ACM_SCP.2.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ADO_DEL.2 Detection of modification

Developer action elements:

ADO_DEL.2.1D - The developer shall document procedures for delivery of the TOE or parts of it to the user.

ADO_DEL.2.2D - The developer shall use the delivery procedures.

Content and presentation of evidence elements:

ADO_DEL.2.1C - The delivery documentation shall describe all procedures that are necessary to maintain security when distributing versions of the TOE to a user's site.

ADO_DEL.2.2C - The delivery documentation shall describe how the various procedures and technical measures provide for the detection of modifications, or any discrepancy between the developer's master copy and the version received at the user site.

ADO_DEL.2.3C - The delivery documentation shall describe how the various procedures allow detection of attempts to masquerade as the developer, even in cases in which the developer has sent nothing to the user's site.

Evaluator action elements:

ADO_DEL.2.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ADO_IGS.1 Installation, generation, and start-up procedures

Developer action elements:

ADO_IGS.1.1D - The developer shall document procedures necessary for the secure installation, generation, and start-up of the TOE.

Content and presentation of evidence elements:

ADO_IGS.1.1C - The documentation shall describe the steps necessary for secure installation, generation, and start-up of the TOE.

Evaluator action elements:

ADO_IGS.1.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ADO_IGS.1.2E - The evaluator shall determine that the installation, generation, and start-up procedures result in a secure configuration.

ADV_FSP.2   Fully defined external interfaces

Developer action elements:

ADV_FSP.2.1D - The developer shall provide a functional specification.

Content and presentation of evidence elements:

ADV_FSP.2.1C - The functional specification shall describe the TSF and its external interfaces using an informal style.
ADV_FSP.2.2C - The functional specification shall be internally consistent.
ADV_FSP.2.3C - The functional specification shall describe the purpose and method of use of all external TSF interfaces, providing complete details of effects, exceptions and error messages.
ADV_FSP.2.4C - The functional specification shall completely represent the TSF.
ADV_FSP.2.5C - The functional specification shall include rationale that the TSF is completely represented.

Evaluator action elements:

ADV_FSP.2.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.
ADV_FSP.2.2E - The evaluator shall determine that the functional specification is an accurate and complete instantiation of the TOE security functional requirements.

> *Application Note: This requirement can potentially be met by a combination of documents provided by the developer, including the Security Target and external interface specification.*

ADV_HLD.2   Security enforcing high-level design

Developer action elements:

ADV_HLD.2.1D - The developer shall provide the high-level design of the TSF.

Content and presentation of evidence elements:

ADV_HLD.2.1C - The presentation of the high-level design shall be informal.
ADV_HLD.2.2C - The high-level design shall be internally consistent.
ADV_HLD.2.3C - The high-level design shall describe the structure of the TSF in terms of subsystems.
ADV_HLD.2.4C - The high-level design shall describe the security functionality provided by each subsystem of the TSF.
ADV_HLD.2.5C - The high-level design shall identify any underlying hardware, firmware, and/or software required by the TSF with a presentation of the functions provided by the supporting protection mechanisms implemented in that hardware, firmware, or software.
ADV_HLD.2.6C - The high-level design shall identify all interfaces to the subsystems of the TSF.
ADV_HLD.2.7C - The high-level design shall identify which of the interfaces to the subsystems of the TSF are externally visible.

ADV_HLD.2.8C - The high-level design shall describe the purpose and method of use of all interfaces to the subsystems of the TSF, providing details of effects, exceptions and error messages, as appropriate.

ADV_HLD.2.9C - The high-level design shall describe the separation of the TOE into TSP-enforcing and other subsystems.

Evaluator action elements:

ADV_HLD.2.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ADV_HLD.2.2E - The evaluator shall determine that the high-level design is an accurate and complete instantiation of the TOE security functional requirements.

ADV_INT.1   Modularity

Developer action elements:

ADV_INT.1.1D The developer shall design and structure the TSF in a modular fashion that avoids unnecessary interactions between the modules of the design.

ADV_INT.1.2D The developer shall provide an architectural description.

Content and presentation of evidence elements:

ADV_INT.1.1C The architectural description shall identify the modules of the TSF.

ADV_INT.1.2C The architectural description shall describe the purpose, interface, parameters, and effects of each module of the TSF.

ADV_INT.1.3C The architectural description shall describe how the TSF design provides for largely independent modules that avoid unnecessary interactions.

Evaluator action elements:

ADV_INT.1.1E The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ADV_INT.1.2E The evaluator shall determine that both the low-level design and the implementation representation are in compliance with the architectural description.

ADV_IMP.2   Implementation of the TSF

Developer action elements:

ADV_IMP.2.1D The developer shall provide the implementation representation for the entire TSF.

Content and presentation of evidence elements:

ADV_IMP.2.1C The implementation representation shall unambiguously define the TSF to a level of detail such that the TSF can be generated without further design decisions.

ADV_IMP.2.2C The implementation representation shall be internally consistent.

ADV_IMP.2.3C The implementation representation shall describe the relationships between all portions of the implementation.

Evaluator action elements:

ADV_IMP.2.1E The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.
ADV_IMP.2.2E The evaluator shall determine that the implementation representation is an accurate and complete instantiation of the TOE security functional requirements.

ADV_LLD.1   Descriptive low-level design

Developer action elements:

ADV_LLD.1.1D - The developer shall provide the low-level design of the TSF.

Content and presentation of evidence elements:

ADV_LLD.1.1C - The presentation of the low-level design shall be informal.
ADV_LLD.1.2C - The low-level design shall be internally consistent.
ADV_LLD.1.3C - The low-level design shall describe the TSF in terms of modules.
ADV_LLD.1.4C - The low-level design shall describe the purpose of each module.
ADV_LLD.1.5C - The low-level design shall define the interrelationships between the modules in terms of provided security functionality and dependencies on other modules.
ADV_LLD.1.6C - The low-level design shall describe how each TSP-enforcing function is provided.
ADV_LLD.1.7C - The low-level design shall identify all interfaces to the modules of the TSF.
ADV_LLD.1.8C - The low-level design shall identify which of the interfaces to the modules of the TSF are externally visible.
ADV_LLD.1.9C - The low-level design shall describe the purpose and method of use of all interfaces to the modules of the TSF, providing details of effects, exceptions and error messages, as appropriate.
ADV_LLD.1.10C - The low-level design shall describe the separation of the TOE into TSP-enforcing and other modules.

Evaluator action elements:

ADV_LLD.1.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.
ADV_LLD.1.2E - The evaluator shall determine that the low-level design is an accurate and complete instantiation of the TOE security functional requirements.

ADV_RCR.1   Informal correspondence demonstration

Developer action elements:

ADV_RCR.1.1D - The developer shall provide an analysis of correspondence between all adjacent pairs of TSF representations that are provided.

Content and presentation of evidence elements:

ADV_RCR.1.1C - For each adjacent pair of provided TSF representations, the analysis shall demonstrate that all relevant security functionality of the more abstract TSF representation is correctly and completely refined in the less abstract TSF representation.

Evaluator action elements:

ADV_RCR.1.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

> *Application Note: The intent of this requirement is for the vendor to provide, and the evaluator to confirm, that there exists accurate, consistent, and clear mappings between each level of design decomposition. Thus there can be no TOE security functions defined at a lower layer of abstraction absent from a higher level of abstraction and vice versa.*

ADV_SPM.1   Informal TOE security policy model

Developer action elements:

ADV_SPM.1.1D - The developer shall provide a TSP model.
ADV_SPM.1.2D - The developer shall demonstrate correspondence between the functional specification and the TSP model.

Content and presentation of evidence elements:

ADV_SPM.1.1C - The TSP model shall be informal.
ADV_SPM.1.2C - The TSP model shall describe the rules and characteristics of all policies of the TSP that can be modeled.
ADV_SPM.1.3C - The TSP model shall include a rationale that demonstrates that it is consistent and complete with respect to all policies of the TSP that can be modeled.
ADV_SPM.1.4C - The demonstration of correspondence between the TSP model and the functional specification shall show that all of the security functions in the functional specification are consistent and complete with respect to the TSP model.

> *Application Note: As part of the secure state, the cryptographic module is in a known state such that all critical areas are empty of plaintext/red/secret data and inaccessible to processes, and all security policies are enforced.*

Evaluator action elements:

ADV_SPM.1.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

AGD_ADM.1 Administrator guidance

Developer action elements:

AGD_ADM.1.1D - The developer shall provide administrator guidance addressed to system administrative personnel.
Content and presentation of evidence elements:
AGD_ADM.1.1C - The administrator guidance shall describe the administrative functions and interfaces available to the administrator of the TOE.
AGD_ADM.1.2C - The administrator guidance shall describe how to administer the TOE in a secure manner.
AGD_ADM.1.3C - The administrator guidance shall contain warnings about functions and privileges that should be controlled in a secure processing environment.
AGD_ADM.1.4C - The administrator guidance shall describe all assumptions regarding user behavior that are relevant to secure operation of the TOE.
AGD_ADM.1.5C - The administrator guidance shall describe all security parameters under the control of the administrator, indicating secure values as appropriate.
AGD_ADM.1.6C - The administrator guidance shall describe each type of security-relevant event relative to the administrative functions that need to be performed, including changing the security characteristics of entities under the control of the TSF.
AGD_ADM.1.7C - The administrator guidance shall be consistent with all other documentation supplied for evaluation.
AGD_ADM.1.8C - The administrator guidance shall describe all security requirements for the IT environment that are relevant to the administrator.

Evaluator action elements:

AGD_ADM.1.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

AGD_USR.1   User guidance

Developer action elements:

AGD_USR.1.1D - The developer shall provide user guidance.

Content and presentation of evidence elements:

AGD_USR.1.1C - The user guidance shall describe the functions and interfaces available to the non-administrative users of the TOE.
AGD_USR.1.2C - The user guidance shall describe the use of user-accessible security functions provided by the TOE.
AGD_USR.1.3C - The user guidance shall contain warnings about user-accessible functions and privileges that should be controlled in a secure processing environment.
AGD_USR.1.4C - The user guidance shall clearly present all user responsibilities necessary for secure operation of the TOE, including those related to assumptions regarding user behavior found in the statement of TOE security environment.

AGD_USR.1.5C - The user guidance shall be consistent with all other documentation supplied for evaluation.

AGD_USR.1.6C - The user guidance shall describe all security requirements for the IT environment that are relevant to the user.

Evaluator action elements:

AGD_USR.1.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ALC_DVS.1   Identification of security measures

Developer action elements:

ALC_DVS.1.1D - The developer shall produce development security documentation.

Content and presentation of evidence elements:

ALC_DVS.1.1C - The development security documentation shall describe all the physical, procedural, personnel, and other security measures that are necessary to protect the confidentiality and integrity of the TOE design and implementation in its development environment.

ALC_DVS.1.2C - The development security documentation shall provide evidence that these security measures are followed during the development and maintenance of the TOE.

Evaluator action elements:

ALC_DVS.1.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ALC_DVS.1.2E - The evaluator shall confirm that the security measures are being applied.

ALC_FLR.2   Flaw Reporting Procedures

ALC_FLR.2.1D - The developer shall document the flaw remediation procedures.

ALC_FLR.2.2D - The developer shall establish a procedure for accepting and acting upon user reports of security flaws and requests for corrections to those flaws.

ALC_FLR.2.1C - The flaw remediation procedures documentation shall describe the procedures used to track all reported security flaws in each release of the TOE.

ALC_FLR.2.2C - The flaw remediation procedures shall require that a description of the nature and effect of each security flaw be provided, as well as the status of finding a correction to that flaw.

ALC_FLR.2.3C - The flaw remediation procedures shall require that corrective actions be identified for each of the security flaws.

ALC_FLR.2.4C - The flaw remediation procedures documentation shall describe the methods used to provide flaw information, corrections and guidance on corrective actions to TOE users.

ALC_FLR.2.5C - The procedures for processing reported security flaws shall ensure that any reported flaws are corrected and the correction issued to TOE users.

ALC_FLR.2.6C - The procedures for processing reported security flaws shall provide safeguards that any corrections to these security flaws do not introduce any new flaws.

ALC_FLR.2.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ALC_LCD.1   Developer defined life-cycle model

Developer action elements:

ALC_LCD.1.1D - The developer shall establish a life-cycle model to be used in the development and maintenance of the TOE.

ALC_LCD.1.2D - The developer shall provide life-cycle definition documentation.

Content and presentation of evidence elements:

ALC_LCD.1.1C - The life-cycle definition documentation shall describe the model used to develop and maintain the TOE.

ALC_LCD.1.2C - The life-cycle model shall provide for the necessary control over the development and maintenance of the TOE.

Evaluator action elements:

ALC_LCD.1.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ALC_TAT.1   Well-defined development tools

Developer action elements:

ALC_TAT.1.1D - The developer shall identify the development tools being used for the TOE.

ALC_TAT.1.2D - The developer shall document the selected implementation-dependent options of the development tools.

Content and presentation of evidence elements:

ALC_TAT.1.1C - All development tools used for implementation shall be well-defined.

ALC_TAT.1.2C - The documentation of the development tools shall unambiguously define the meaning of all statements used in the implementation.

ALC_TAT.1.3C - The documentation of the development tools shall unambiguously define the meaning of all implementation-dependent options.

Evaluator action elements:

ALC_TAT.1.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

AMA_AMP.1   Assurance maintenance plan

Developer action elements:

AMA_AMP.1.1D - The developer shall provide an AM Plan.

Content and presentation of evidence elements:

AMA_AMP.1.1C - The AM Plan shall contain or reference a brief description of the TOE, including the security functionality it provides.
AMA_AMP.1.2C - The AM Plan shall identify the certified version of the TOE, and shall reference the evaluation results.
AMA_AMP.1.3C - The AM Plan shall reference the TOE component categorization report for the certified version of the TOE.
AMA_AMP.1.4C - The AM Plan shall define the scope of changes to the TOE that are covered by the plan.
AMA_AMP.1.5C - The AM Plan shall describe the TOE life-cycle, and shall identify the current plans for any new releases of the TOE, together with a brief description of any planned changes that are likely to have a significant security impact.
AMA_AMP.1.6C - The AM Plan shall describe the assurance maintenance cycle, stating and justifying the planned schedule of AM audits and the target date of the next re-evaluation of the TOE.
AMA_AMP.1.7C - The AM Plan shall identify the individual(s) who will assume the role of developer security analyst for the TOE.
AMA_AMP.1.8C - The AM Plan shall describe how the developer security analyst role will ensure that the procedures documented or referenced in the AM Plan are followed.
AMA_AMP.1.9C - The AM Plan shall describe how the developer security analyst role will ensure that all developer actions involved in the analysis of the security impact of changes affecting the TOE are performed correctly.
AMA_AMP.1.10C - The AM Plan shall justify why the identified developer security analyst(s) have sufficient familiarity with the security target, functional specification and (where appropriate) high-level design of the TOE, and with the evaluation results and all applicable assurance requirements for the certified version of the TOE.
AMA_AMP.1.11C - The AM Plan shall describe or reference the procedures to be applied to maintain the assurance in the TOE, which as a minimum shall include the procedures for configuration management, maintenance of assurance evidence, performance of the analysis of the security impact of changes affecting the TOE, and flaw remediation.

Evaluator action elements:

> AMA_AMP.1.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.
> AMA_AMP.1.2E - The evaluator shall confirm that the proposed schedules for AM audits and re-evaluation of the TOE are acceptable and consistent with the proposed changes to the TOE.

AMA_CAT.1   TOE component categorization report

Developer action elements:

> AMA_CAT.1.1D - The developer shall provide a TOE component categorization report for the certified version of the TOE.

Content and presentation of evidence elements:

> AMA_CAT.1.1C - The TOE component categorization report shall categories each component of the TOE, identifiable in each TSF representation from the most abstract to the least abstract, according to its relevance to security; as a minimum, TOE components must be categorized as one of TSP-enforcing or non-TSP- enforcing.
> AMA_CAT.1.2C - The TOE component categorization report shall describe the categorization scheme used, so that it can be determined how to categorize new components introduced into the TOE, and also when to re-categorize existing TOE components following changes to the TOE or its security target.
> AMA_CAT.1.3C - The TOE component categorization report shall identify any tools used in the development environment that, if modified, will have an impact on the assurance that the TOE satisfies its security target.

Evaluator action elements:

> AMA_CAT.1.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.
> AMA_CAT.1.2E - The evaluator shall confirm that the categorization of TOE components and tools, and the categorization scheme used, are appropriate and consistent with the evaluation results for the certified version.

AMA_EVD.1   Evidence of maintenance process

Developer action elements:

> AMA_EVD.1.1D - The developer security analyst shall provide AM documentation for the current version of the TOE.

Content and presentation of evidence elements:

> AMA_EVD.1.1C - The AM documentation shall include a configuration list and a list of identified vulnerabilities in the TOE.
> AMA_EVD.1.2C - The configuration list shall describe the configuration items that comprise the current version of the TOE.

AMA_EVD.1.3C - The AM documentation shall provide evidence that the procedures documented or referenced in the AM Plan are being followed.
AMA_EVD.1.4C - The list of identified vulnerabilities in the current version of the TOE shall show, for each vulnerability, that the vulnerability cannot be exploited in the intended environment for the TOE.

Evaluator action elements:

AMA_EVD.1.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.
AMA_EVD.1.2E - The evaluator shall confirm that the procedures documented or referenced in the AM Plan are being followed.
AMA_EVD.1.3E - The evaluator shall confirm that the security impact analysis for the current version of the TOE is consistent with the configuration list.
AMA_EVD.1.4E - The evaluator shall confirm that all changes documented in the security impact analysis for the current version of the TOE are within the scope of changes covered by the AM Plan.
AMA_EVD.1.5E - The evaluator shall confirm that functional testing has been performed on the current version of the TOE, to a degree commensurate with the level of assurance being maintained.

AMA_SIA.1   Sampling of security impact analysis

Developer action elements:

AMA_SIA.1.1D - The developer security analyst shall, for the current version of the TOE, provide a security impact analysis that covers all changes affecting the TOE as compared with the certified version.

Content and presentation of evidence elements:

AMA_SIA.1.1C - The security impact analysis shall identify the certified TOE from which the current version of the TOE was derived.
AMA_SIA.1.2C - The security impact analysis shall identify all new and modified TOE components that are categorized as TSP-enforcing.
AMA_SIA.1.3C - The security impact analysis shall, for each change affecting the security target or TSF representations, briefly describe the change and any effects it has on lower representation levels.
AMA_SIA.1.4C - The security impact analysis shall, for each change affecting the security target or TSF representations, identify all IT security functions and all TOE components categorized as TSP-enforcing that are affected by the change.
AMA_SIA.1.5C - The security impact analysis shall, for each change which results in a modification of the implementation representation of the TSF or the IT environment, identify the test evidence that shows, to the required level of assurance, that the TSF continues to be correctly implemented following the change.
AMA_SIA.1.6C - The security impact analysis shall, for each applicable assurance requirement in the configuration management (Class ACM Configuration management), life cycle support (Class ALC Life cycle support),

delivery and operation (Class ADO Delivery and operation) and guidance documents (Class AGD Guidance documents) assurance classes, identify any evaluation deliverables that have changed, and provide a brief description of each change and its impact on assurance.

AMA_SIA.1.7C - The security impact analysis shall, for each applicable assurance requirement in the vulnerability assessment (Class AVA Vulnerability assessment) assurance class, identify which evaluation deliverables have changed and which have not, and give reasons for the decision taken as to whether or not to update the deliverable.

Evaluator action elements:

AMA_SIA.1.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

AMA_SIA.1.2E - The evaluator shall check, by sampling, that the security impact analysis documents changes to an appropriate level of detail, together with appropriate justifications that assurance has been maintained in the current version of the TOE.

ATE_COV.2   Analysis of coverage

Developer action elements:

ATE_COV.2.1D - The developer shall provide an analysis of the test coverage.

Content and presentation of evidence elements:

ATE_COV.2.1C - The analysis of the test coverage shall demonstrate the correspondence between the tests identified in the test documentation and the TSF as described in the functional specification.

ATE_COV.2.2C - The analysis of the test coverage shall demonstrate that the correspondence between the TSF as described in the functional specification and the tests identified in the test documentation is complete.

Evaluator action elements:

ATE_COV.2.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ATE_DPT.2   Testing: low-level design

Developer action elements:

ATE_DPT.2.1D - The developer shall provide the analysis of the depth of testing.

Content and presentation of evidence elements:

ATE_DPT.2.1C - The depth analysis shall demonstrate that the tests identified in the test documentation are sufficient to demonstrate that the TSF operates in accordance with its high-level design and low-level design.

Evaluator action elements:

ATE_DPT.2.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ATE_FUN.1 Functional testing

Developer action elements:

ATE_FUN.1.1D - The developer shall test the TSF and document the results.
ATE_FUN.1.2D - The developer shall provide test documentation.

Content and presentation of evidence elements:

ATE_FUN.1.1C - The test documentation shall consist of test plans, test procedure descriptions, expected test results and actual test results.
ATE_FUN.1.2C - The test plans shall identify the security functions to be tested and describe the goal of the tests to be performed.
ATE_FUN.1.3C - The test procedure descriptions shall identify the tests to be performed and describe the scenarios for testing each security function. These scenarios shall include any ordering dependencies on the results of other tests.
ATE_FUN.1.4C - The expected test results shall show the anticipated outputs from a successful execution of the tests.
ATE_FUN.1.5C - The test results from the developer execution of the tests shall demonstrate that each tested security function behaved as specified.

Evaluator action elements:

ATE_FUN.1.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

ATE_IND.2 Independent testing - sample

Developer action elements:

ATE_IND.2.1D - The developer shall provide the TOE for testing.

Content and presentation of evidence elements:

ATE_IND.2.1C - The TOE shall be suitable for testing.
ATE_IND.2.2C - The developer shall provide an equivalent set of resources to those that were used in the developer's functional testing of the TSF.

Evaluator action elements:

ATE_IND.2.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.
ATE_IND.2.2E - The evaluator shall test a subset of the TSF as appropriate to confirm that the TOE operates as specified.
ATE_IND.2.3E - The evaluator shall execute a sample of tests in the test documentation to verify the developer test results.

Explicit: Systematic Cryptographic Module Covert Channel Analysis

(AVA_CCA_EXP.2)

> *Application Note: The covert channel analysis is performed on the entire TSF to determine that TSF interfaces cannot be used covertly to obtain critical security parameters; a search is made for the leakage of critical security parameters, rather than a violation of an information control policy.*

Developer action elements:

AVA_CCA_EXP.2.1D - The developer shall conduct a search for covert channels for the leakage of critical security parameters.

AVA_CCA_EXP.2.2D - The developer shall provide covert channel analysis documentation.

Content and presentation of evidence elements:

AVA_CCA_EXP.2.1C - The analysis documentation shall identify covert channels that leak critical security parameters and estimate their capacity.

AVA_CCA_EXP.2.2C - The analysis documentation shall describe the procedures used for determining the existence of covert channels that leak critical security parameters, and the information needed to carry out the covert channel analysis.

AVA_CCA_EXP.2.3C - The analysis documentation shall describe all assumptions made during the covert channel analysis.

AVA_CCA_EXP.2.4C - The analysis documentation shall describe the method used for estimating channel capacity, based on worst-case scenarios.

AVA_CCA_EXP.2.5C - The analysis documentation shall describe the worst-case exploitation scenario for each identified covert channel.

AVA_CCA_EXP.2.6C - The analysis documentation shall provide evidence that the method used to identify covert channels is systematic.

Evaluator action elements:

AVA_CCA_EXP.2.1E The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

AVA_CCA_EXP.2.3E - The evaluator shall selectively validate the covert channel analysis through independent analysis and testing.

> *Application Note: The cryptographic security parameters are defined in FIPS 140-2.*

AVA_MSU.2 Validation of analysis

Developer action elements:

AVA_MSU.2.1D - The developer shall provide guidance documentation.

AVA_MSU.2.2D - The developer shall document an analysis of the guidance documentation.

Content and presentation of evidence elements:

AVA_MSU.2.1C - The guidance documentation shall identify all possible modes of operation of the TOE (including operation following failure or operational error), their consequences and implications for maintaining secure operation.

AVA_MSU.2.2C - The guidance documentation shall be complete, clear, consistent and reasonable.

AVA_MSU.2.3C - The guidance documentation shall list all assumptions about the intended environment.

AVA_MSU.2.4C - The guidance documentation shall list all requirements for external security measures (including external procedural, physical and personnel controls).

AVA_MSU.2.5C - The analysis documentation shall demonstrate that the guidance documentation is complete.

Evaluator action elements:

AVA_MSU.2.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

AVA_MSU.2.2E - The evaluator shall repeat all configuration and installation procedures, and other procedures selectively, to confirm that the TOE can be configured and used securely using only the supplied guidance documentation.

AVA_MSU.2.3E - The evaluator shall determine that the use of the guidance documentation allows all insecure states to be detected.

AVA_MSU.2.4E - The evaluator shall confirm that the analysis documentation shows that guidance is provided for secure operation in all modes of operation of the TOE.

AVA_SOF.1 Strength of TOE security function evaluation

Developer action elements:

AVA_SOF.1.1D - The developer shall perform a strength of TOE security function analysis for each mechanism identified in the Security Target as having a strength of TOE security function claim.

Content and presentation of evidence elements:

AVA_SOF.1.1C - For each mechanism with a strength of TOE security function claim the strength of TOE security function analysis shall show that it meets or exceeds the minimum strength level defined in the PP/ST.

AVA_SOF.1.2C - For each mechanism with a specific strength of TOE security function claim the strength of TOE security function analysis shall show that it meets or exceeds the specific strength of function metric defined in the PP/ST.

Evaluator action elements:

AVA_SOF.1.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

AVA_SOF.1.2E - The evaluator shall confirm that the strength claims are correct.

AVA_VLA.3   Moderately resistant

Developer action elements:

AVA_VLA.3.1D - The developer shall perform and document an analysis of the TOE deliverables searching for ways in which a user can violate the TSP.

AVA_VLA.3.2D - The developer shall document the disposition of identified vulnerabilities.

Content and presentation of evidence elements:

AVA_VLA.3.1C - The documentation shall show, for all identified vulnerabilities, that the vulnerability cannot be exploited in the intended environment for the TOE.

AVA_VLA.3.2C - The documentation shall justify that the TOE, with the identified vulnerabilities, is resistant to obvious penetration attacks.

AVA_VLA.3.3C – The evidence shall show that the search for vulnerabilities is systematic.

Evaluator action elements:

AVA_VLA.3.1E - The evaluator shall confirm that the information provided meets all requirements for content and presentation of evidence.

AVA_VLA.3.2E - The evaluator shall conduct penetration testing, building on the developer vulnerability analysis, to ensure the identified vulnerabilities have been addressed.

AVA_VLA.3.3E - The evaluator shall perform an independent vulnerability analysis.

AVA_VLA.3.4E - The evaluator shall perform independent penetration testing, based on the independent vulnerability analysis, to determine the exploitability of additional identified vulnerabilities in the intended environment.

AVA_VLA.3.5E - The evaluator shall determine that the TOE is resistant to penetration attacks performed by an attacker possessing a moderate attack potential.

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6 RATIONALE

This section describes the rationale for the Security Objectives and Security Functional Requirements as defined in Section 4 and Section 5, respectively. Additionally, this section describes the rationale for not satisfying all of the dependencies and the rationale for the strength of function (SOF) claim.

6.1 RATIONALE FOR TOE SECURITY OBJECTIVES

Table 6.1 – Security Objectives to Threats and Policies Mappings

Threat/Policy	Objectives Addressing the Threat	Rationale
T.ADMIN_ERROR An administrator may incorrectly install or configure the TOE, or install a corrupted TOE, resulting in ineffective security mechanisms.	O.ROBUST_ADMIN_GUIDANCE The TOE will provide administrators with the necessary information for secure delivery and management. O.ADMIN_ROLE The TOE will provide administrator roles to isolate administrative actions. O.MANAGE The TOE will provide all the functions and facilities necessary to support the administrators in their management of the security of the TOE, and restrict these functions and facilities from unauthorized use.	O.ROBUST_ADMIN_GUIDANCE (ADO_DEL.2, ADO_IGS.1, AGD_ADM.1, AGD_USR.1, AVA_MSU.2) help to mitigate this threat by ensuring the TOE administrators have guidance that instructs them how to administer the TOE in a secure manner and to provide the administrator with instructions to ensure the TOE was not corrupted during the delivery process. Having this guidance helps to reduce the mistakes that an administrator might make that could cause the TOE to be configured in a way that is insecure. O.ADMIN_ROLE (FMT_SMR.2(1)-(2)) plays a role in mitigating this threat by limiting the functions an administrator can perform in a given role. For example, the Audit Administrator could not make a configuration mistake that would impact the directory access control policy. Likewise, a directory manager could only affect policies in the sub-hierarchy they are responsible for, and not other sub-hierarchies or global directory policies. O.MANAGE (FMT_MTD.1(1), FMT_MTD.1(2), FMT_MTD.1(4) FMT_SMF.1) also contributes to mitigating this threat by providing administrators the capability to view configuration settings. For example, if the Directory Administrator made a mistake when configuring the directory schema, providing them the capability to view and manipulate the schema affords them the ability to discover any mistakes that might have been made. In addition administrators have the capability to recover from an error or corrupted TSF data.
T.ADMIN_ROGUE An administrator's intentions may become malicious resulting in user or TSF data being compromised.	O.ADMIN_ROLE The TOE will provide administrator roles to isolate administrative actions.	O.ADMIN_ROLE (FMT_SMR.2(1)) mitigates this threat by restricting the functions available to an administrator. This is somewhat different than the part this objective plays in countering T.ADMIN_ERROR, in that this presumes that separate individuals will be assigned separate roles. If the Audit Administrator's intentions become malicious they would not be able to render the TOE unable to enforce its directory access control policy. On the other hand, if the Directory Administrator becomes malicious they could affect the directory access control policy, but the Audit Administrator may be able to detect those actions.
T.AUDIT_COMPROMISE A malicious user or process may view	O.AUDIT_PROTECTION The TOE will provide the capability to protect audit	O.AUDIT_PROTECTION (FAU.SAR.2, FAU_STG.1-NIAP-0429, FAU_STG.3, FAU_STG.NIAP-0429-1, FMT_SMF.1) contributes

Threat/Policy	Objectives Addressing the Threat	Rationale
audit records, cause audit records to be lost or modified, or prevent future audit records from being recorded, thus masking a user's action.	information. O.RESIDUAL_INFORMATION The TOE will ensure that any information contained in a protected resource is not released when the resource is reallocated. O.SELF_PROTECTION The TSF will maintain a domain for its own execution that protects itself and its resources from external interference, tampering, or unauthorized disclosure.	to mitigating this threat by controlling access to the audit trail. The auditor and any trusted IT entities performing IDS-like functions are the only ones allowed to read the audit trail. No one is allowed to modify audit records, and the Auditor is the only one allowed to delete audit records in the audit trail. The TOE has the capability to prevent auditable actions from occurring if the audit trail is full, and of notifying an administrator if the audit trail is approaching its capacity. In addition, the TOE has the capability to restore audit data corrupted by the attacker. O.RESIDUAL_INFORMATION (FDP.RIP.2) prevents a user not authorized to read the audit trail from access to audit information that might otherwise be persistent in a TOE resource (e.g., memory). By ensuring the TOE prevents residual information in a resource, audit information will not become available to any user or process except those explicitly authorized for that data. O.SELF_PROTECTION (FPT_SEP.2-NIAP-0424, FPT_RVM.1) contributes to countering this threat by ensuring that the TSF can protect itself from users. If the TSF could not maintain and control its domain of execution, it could not be trusted to control access to the resources under its control, which includes the audit trail. Likewise, ensuring that the functions that protect the audit trail are always invoked is also critical to the mitigation of this threat.
T.CRYPTO_COMPROMISE A malicious user or process may cause key, data or executable code associated with the cryptographic functionality to be inappropriately accessed (viewed, modified, or deleted), thus compromise the cryptographic mechanisms and the data protected by those mechanisms.	O.CRYPTOGRAPHY_VALIDATED The TOE shall use NIST FIPS 140-2 validated cryptomodules for cryptographic services implementing FIPS-approved security functions and random number generation services used by cryptographic functions. O.CRYPTOGRAPHIC_FUNCTIONS The TOE shall provide cryptographic functions for its own use, including encryption/decryption and digital signature operations. O.SELF_PROTECTION The TSF will maintain a domain for its own execution that protects itself and its resources from external interference, tampering, or unauthorized disclosure. O.DOCUMENT_KEY_LEAKAGE The bandwidth of channels that can be used to compromise key material shall be documented.	O.CRYPTOGRAPHY_VALIDATED (FCS_BCM_EXP.1) contributes to mitigating this threat by requiring FIPS-approved functions to be used, thus lessening the chance that a poorly-thought-out algorithm could be compromised by an adversary. Additionally, the requirements levied on the cryptomodule by the FIPS process, and the verification of those requirements by the FIPS labs, helps add assurance that the cryptographic module can protect itself. O.CRYPTOGRAPHIC_FUNCTIONS (FCS_CKM.4) mitigates the possibility of malicious users or processes from gaining inappropriate access to cryptographic data, including keys. This objective ensures that the cryptographic data does not reside in a resource that has been used by the cryptographic functions and then reallocated to another process. O.SELF_PROTECTION (FPT_SEP.2-NIAP-0424, FPT_RVM.1) contributes to countering this threat by ensuring that the TSF can protect itself from users. If the TSF could not maintain and control its domain of execution, it could not be trusted to control access to the resources under its control, which includes the cryptographic data and executable code. O.DOCUMENT_KEY_LEAKAGE (AVA_CCA_EXP.2) addresses this threat by requiring the developer to perform an analysis that documents the amount of key information that can be leaked via a covert channel. This provides information that identifies how much material could be inappropriately obtained within a specified time period.

Threat/Policy	Objectives Addressing the Threat	Rationale
T.MASQUERADE A user may masquerade as another entity in order to gain access to data or TOE resources.	O.ROBUST_TOE_ACCESS The TOE will provide mechanisms that control a user's logical access to the TOE and to explicitly deny access to specific users when appropriate O.TRUSTED_PATH The TOE will provide a means to ensure users are not communicating with some other entity pretending to be the TOE, and that the TOE is communicating with an authorized IT entity and not some other entity pretending to be an authorized IT entity.	O.ROBUST_TOE_ACCESS (FIA_AFL.1-NIAP-0425, FIA_ATD.1(1)-(3), FIA_UID.2, FIA_UAU.1, FIA_UAU.2, FIA_UAU.5, FTA_TSE.1, AVA_SOF.1, FPT_TDC.1(1)-(2), FPT_ITA.1) mitigates this threat by controlling the logical access to the TOE and its resources. By constraining how and when authorized users can access the TOE, and by mandating the type and strength of the authentication mechanisms, this objective helps mitigate the possibility of a user attempting to login and masquerade as an authorized user. In addition, this objective provides the administrator the means to control the number of failed login attempts a user can generate before an account is locked out, further reducing the possibility of a user gaining unauthorized access to the TOE. This objective also allows the TOE to correctly interpret information used during the authentication process so that it can make the correct decisions when identifying and authenticating users. Finally, this objective provides the ability to control access to certificates and revocation lists so they are available in a timely fashion, contributing to correct authentication decisions. O.TRUSTED_PATH (FTP_ITC.1(1), FTP_ITC.1(2)) ensures that the communication path end points between the TOE and trusted IT entities are defined. This mechanism allows the TOE to be assured that it is communicating with a trusted IT entity, and that another (untrusted) entity is not attempt to access TSF resources.
T.FLAWED_DESIGN Unintentional or intentional errors in requirements specification or design of the TOE may occur, leading to flaws that may be exploited by a malicious user or program.	O.CHANGE_MANAGEMENT The configuration of, and all changes to, the TOE and its development evidence will be analyzed, tracked, and controlled throughout the TOE's development. O.RATINGS_MAINTENANCE Procedures to maintain the TOE's rating will be documented and followed. O.SOUND_DESIGN The design of the TOE will be the result of sound design principles and techniques; the design of the TOE, as well as the design principles and techniques, are adequately and accurately documented. O.VULNERABILITY_ANALYSIS_ TEST The TOE will undergo appropriate independent vulnerability analysis and penetration testing to demonstrate the design and implementation of the TOE does not allow attackers with medium attack potential to violate the TOE's security policies.	O.SOUND_DESIGN (ADV_FSP.2, ADV_HLD.2, ADV_INT.1, ADV_LLD.1, ADV_RCR.1, ADV_SPM.1) counters this threat, to a degree, by requiring that the TOE be developed using sound engineering principles. By accurately and completely documenting the design of the security mechanisms in the TOE, including a security model, the design of the TOE can be better understood, which increases the chances that design errors will be discovered. O.CHANGE_MANAGEMENT (ACM_AUT.1, ACM_CAP.4, ACM_SCP.2, ALC_DVS.1, ALC_FLR.2, ALC_LCD.1) plays a role in countering this threat by requiring the developer to provide control of the changes made to the TOE's design. This includes controlling physical access to the TOE's development area, and having an automated configuration management system that ensures changes made to the TOE go through an approval process and only those persons that are authorized can make changes to the TOE's design and its documentation. O.RATINGS_MAINTENANCE (AMA_AMP.1, AMA_CAT.1, AMA_EVD.1, AMA_SIA.1) contributes to countering this threat by requiring the TOE to go through a security analysis when changes are made to the TSF. This compliments O.CHANGE_MANAGEMENT by requiring the developer to employ a process that ensures changes to the TOE are analyzed and made in a controlled manner. O.VULNERABILITY ANALYSIS TEST

Threat/Policy	Objectives Addressing the Threat	Rationale
		(AVA_VLA.3) ensures that the design of the TOE is independently analyzed for design flaws. Having an independent party perform the assessment ensures an objective approach is taken and may find errors in the design that would be left undiscovered by developers that have a preconceived incorrect understanding of the TOE's design.
T.CORRUPTED_IMPLEMENTATION Unintentional or intentional errors in implementation of the TOE design may occur, leading to flaws that may be exploited by a malicious user or program.	O.CHANGE_MANAGEMENT The configuration of, and all changes to, the TOE and its development evidence will be analyzed, tracked, and controlled throughout the TOE's development. O.RATINGS_MAINTENANCE Procedures to maintain the TOE's rating will be documented and followed. O.SOUND_IMPLEMENTATION The implementation of the TOE will be an accurate instantiation of its design, and is adequately and accurately documented. O.THOROUGH_FUNCTIONAL_ TESTING The TOE will undergo appropriate security functional testing that demonstrates the TSF satisfies the security functional requirements. O.VULNERABILITY_ANALYSIS_ TEST The TOE will undergo appropriate independent vulnerability analysis and penetration testing to demonstrate the design and implementation of the TOE does not allow attackers with medium attack potential to violate the TOE's security policies.	O.CHANGE_MANAGEMENT (ACM_CAP.4, ACM_SCP.2, ALC_DVS.1, ALC_FLR.2, ALC_LCD.1, ACM_AUT.1) This objective plays a role in mitigating this threat in the same way that the flawed design threat is mitigated. By controlling who has access to the TOE's implementation representation and ensuring that changes to the implementation are analyzed and made in a controlled manner, the threat of intentional or unintentional errors being introduced into the implementation are reduced. O.RATINGS_MAINTENANCE (AMA_AMP.1, AMA_CAT.1, AMA_EVD.1, AMA_SIA.1) as with O.CHANGE_MANAGEMENT, this objective counters this threat in the same way that the flawed design threat is mitigated. Requiring that a security analyst review and analyze the changes made to the implementation helps ensure that errors that may affect the TOE's ability to enforce its security policies are reduced. In addition to documenting the design so that implementers have a thorough understanding of the design, O.SOUND_IMPLEMENTATION (ADV_IMP.2, ADV_LLD.1, ADV_RCR.1, ADV_INT.1, ALC_TAT.1) requires that the developer's tools and techniques for implementing the design are documented. Having accurate and complete documentation, and having the appropriate tools and procedures in the development process helps reduce the likelihood of unintentional errors being introduced into the implementation. Although the previous three objectives help minimize the introduction of errors into the implementation, O.THOROUGH_FUNCTIONAL_TESTING (ATE_COV.2, ATE_FUN.1, ATE_DPT.2, ATE_IND.2) increases the likelihood that any errors that do exist in the implementation (with respect to the functional specification, high level, and low-level design) will be discovered through testing. O.VULNERABILITY_ANALYSIS_TEST (AVA_VLA.3) helps reduce errors in the implementation that may not be discovered during functional testing. Ambiguous design documentation, and the fact that exhaustive testing of the external interfaces is not required may leave bugs in the implementation undiscovered in functional testing. Having an independent party perform a vulnerability analysis and conduct testing outside the scope of functional testing increases the likelihood of finding errors.
T.POOR_TEST Lack of or insufficient tests to demonstrate that all TOE security functions operate correctly (including in	O.CORRECT_ TSF_OPERATION The TOE will provide the capability to test the TSF to ensure the correct operation of the TSF at a customer's site.	Design analysis determines that TOE's documented design satisfies the security functional requirements. In order to ensure the TOE's design is correctly realized in its implementation, the appropriate level of functional testing of the TOE's security

Threat/Policy	Objectives Addressing the Threat	Rationale
a fielded TOE) may result in incorrect TOE behavior being undiscovered thereby causing potential security vulnerabilities.	site. O.THOROUGH_FUNCTIONAL_ TESTING The TOE will undergo appropriate security functional testing that demonstrates the TSF satisfies the security functional requirements. O.VULNERABILITY_ANALYSIS_ TEST The TOE will undergo appropriate independent vulnerability analysis and penetration testing to demonstrate the design and implementation of the TOE does not allow attackers with medium attack potential to violate the TOE's security policies.	mechanisms must be performed during the evaluation of the TOE. O.THOROUGH_FUNCTIONAL_ TESTING (ATE_FUN.1, ATE_COV.2, ATE_DPT.2, ATE_IND.2) ensures that adequate functional testing is performed to demonstrate the TSF satisfies the security functional requirements and that the TOE's security mechanisms operate as documented. While functional testing serves an important purpose, it does not ensure the TSFI cannot be used in unintended ways to circumvent the TOE's security policies. O.VULNERABILITY_ANALYSIS_TEST (AVA_VLA.3) addresses this concern by requiring a vulnerability analysis be performed in conjunction with testing that goes beyond functional testing. This objective provides a measure of confidence that the TOE does not contain security flaws that may not be identified through functional testing. While these testing activities are necessary for successful completion of an evaluation, this testing activity does not address the concern that the TOE continues to operate correctly and enforce its security policies once it has been fielded. Some level of testing must be available to end users to ensure the TOE's security mechanisms continue to operate correctly once the TOE is fielded. O.CORRECT_ TSF_OPERATION (FPT_TST_EXP.4, FPT_TST_EXP.5) ensures that once the TOE is installed at a customer's location, the capability exists that the integrity of the TSF (hardware and software, including the cryptographic functions) can be demonstrated, and thus providing end users the confidence that the TOE's security policies continue to be enforced.
T.REPLAY A user may gain inappropriate access to the TOE by replaying authentication information.	O.REPLAY_DETECTION The TOE will provide a means to detect and reject the replay of authentication data.	O.REPLAY_DETECTION (FPT_RPL.1) prevents a user from replaying authentication data. Prevention of replay of authentication data will counter the threat that a user will be able to record an authentication session between a trusted entity (administrative user or trusted IT entity) and then replay it to gain access to the TOE, as well as counter the ability of a user to act as another user.
T.RESIDUAL_DATA A user or process may gain unauthorized access to data through reallocation of TOE resources from one user or process to another.	O.RESIDUAL_INFORMATION The TOE will ensure that any information contained in a protected resource is not released when the resource is reallocated. O.CRYPTOGRAPHIC_FUNCTIONS The TOE shall provide cryptographic functions for its own use, including encryption/decryption and digital signature operations.	O.RESIDUAL_INFORMATION (FDP_RIP.2) counters this threat by ensuring that TSF data and user data is not persistent when resources are released by one user/process and allocated to another user/process. This means that network packets sent in response to a request will not have residual data from another packet (potentially from another user) due to the padding of a packet. O.CRYPTOGRAPHIC_FUNCTIONS (FCS_CKM.4) mitigates this threat by ensuring that the cryptographic data does not reside in a resource that has been used by the cryptographic functions and then reallocated to another process
T.RESOURCE_EXHAUSTION A malicious process or user may block others from system resources (e.g., CPU time) via a resource exhaustion denial of service attack.	O.RESOURCE_SHARING The TOE shall provide mechanisms that mitigate attempts to exhaust CPU time and available network connections provided by the TOE.	O.RESOURCE_SHARING (FRU_RSA.1(1)-(2), FMT_MTD.2(1)-(2)) mitigates this threat by requiring the TOE to provide controls relating to two different resources: CPU time and available network connections. The administrator is allowed to specify a percentage of processor time that is allowed to be used so that an attempt to exhaust the resource will

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		fail when it reaches the quota. This objective also addresses the denial-of-service attack of a user attempting to exhaust the connection-oriented resources by generating a large number of half-open connections (e.g., SYN attack).
T.SPOOFING An entity may misrepresent itself as the TOE to obtain authentication data.	**O.TRUSTED_PATH** The TOE will provide a means to ensure users are not communicating with some other entity pretending to be the TOE, and that the TOE is communicating with a authorized IT entity and not some other entity pretending to be a authorized IT entity.	It is possible for an entity other than the TOE (a subject on the TOE, or another IT entity on the network between the TOE and the end user) to provide an environment that may lead a user to mistakenly believe they are interacting with the TOE, thereby fooling the user into divulging identification and authentication information. O.TRUSTED_PATH (FTP_ITC.1(1), FTP_ITC.1(2), FTP_TRP.1(1), FTP_TRP.1(2)) mitigates this threat by ensuring users have the capability to ensure they are communicating with the TOE when providing identification and authentication data to the TOE.
T.MALICIOUS_TSF_ COMPROMISE A malicious user or process may cause TSF data or executable code to be inappropriately accessed (viewed, modified, or deleted).	**O.DISPLAY_BANNER** The TOE will display an advisory warning regarding use of the TOE. **O.MANAGE** The TOE will provide all the functions and facilities necessary to support the administrators in their management of the security of the TOE, and restrict these functions and facilities from unauthorized use. **O.RESIDUAL_INFORMATION** The TOE will ensure that any information contained in a protected resource is not released when the resource is reallocated. **O.SELF_PROTECTION** The TSF will maintain a domain for its own execution that protects itself and its resources from external interference, tampering, or unauthorized disclosure. **O.TRUSTED_PATH** The TOE will provide a means to ensure users are not communicating with some other entity pretending to be the TOE, and that the TOE is communicating with an authorized IT entity and not some other entity pretending to be an authorized IT entity.	O.TRUSTED_PATH (FTP_TRP.1(1), FTP_TRP.1(2), FTP_ITC.1(1), FTP_ITC.1(2)) plays a role in addressing this threat by ensuring that there is a trusted communication path between the TSF and various users (remote administrators, relying parties (for authentication) and trusted IT entities (for performing replication, for instance)). This ensures the transmitted data cannot be compromised or disclosed during the duration of the trusted path. The protection offered by this objective is limited to TSF data, including authentication data and all data sent or received by trusted IT entities (a relying party's user data is not protected; only the authentication portion of the session is protected). O.MANAGE (FMT_MTD.1(1)-(4), FMT_MSA.1, FMT_MOF.1(1)-(2), FMT_MTD.2(1)-(2)) provides the capability to restrict access to TSF to those that are authorized to use the functions. Satisfaction of this objective (and its associated requirements) prevents unauthorized access to TSF functions and data through the administrative mechanisms. O.RESIDUAL_INFORMATION (FDP_RIP.2) is necessary to mitigate this threat by ensuring no TSF data remain in resources allocated to a user. Even if the security mechanisms do not allow a user to explicitly view TSF data, if TSF data were to inappropriately reside in a resource that was made available to a user, that user would be able to inappropriately view the TSF data. O.SELF_PROTECTION (FPT_SEP.2-NIAP-0424, FPT_RVM.1) requires that the TSF be able to protect itself from tampering and that the security mechanisms in the TSF cannot be bypassed. Without this objective, there could be no assurance that users could not view or modify TSF data or TSF executables. O.DISPLAY_BANNER (FTA_TAB.1) helps mitigate this threat by providing the Platform Administrator the ability to remove product information (e.g., product name, version number) from a banner that is displayed to users. Having product information about the TOE provides an attacker with information that may increase their ability to compromise the TOE.

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T.UNATTENDED_SESSION A user may gain unauthorized access to an unattended session.	O.ROBUST_TOE_ACCESS The TOE will provide mechanisms that control a user's logical access to the TOE and to explicitly deny access to specific users when appropriate	O.ROBUST_TOE_ACCESS (FTA_SSL.1, FTA_SSL.2, FTA_SSL.3(1)-(2)) helps to mitigate this threat by including mechanisms that place controls on user's sessions. Local administrator's sessions are locked and remote sessions are dropped after a Platform Administrator-defined time period of inactivity. Locking the local administrator's session reduces the opportunity of someone gaining unauthorized access the session when the console is unattended. Dropping the connection of a remote session (after the specified time period) reduces the risk of someone accessing the remote machine where the session was established, thus gaining unauthorized access to the session.
T.UNAUTHORIZED_ACCESS A user may gain access to user data for which they are not authorized according to the TOE security policy.	O.MEDIATE The TOE must protect user data in accordance with its security policy. O.SELF_PROTECTION The TSF will maintain a domain for its own execution that protects itself and its resources from external interference, tampering, or unauthorized disclosure.	O.MEDIATE (FDP_ACC.2, FDP_ACF.1) works to mitigate this threat by requiring that objects in the directory are protected using access control items. An access control item contains information about who is allowed to access an object, as well as the allowed modes of access. The settings present in the access control item selected in the access control decision process determine whether or not a user is authorized to access the object. It should be noted that multiple security policies can be (but do not *have* to be) in place in a single TOE, meaning that the process by which the target ACI is selected can be different for two different objects. It is required, however, that all objects be covered by this policy. Note that O.SELF_PROTECTION (FPT_RVM.1) ensures that this access control mechanism is always invoked, thus ensuring that users cannot bypass the mechanism to access data for which they are not authorized. Because of the A.NO_GENERAL_PURPOSE assumption and the other requirements on the TOE, there is no requirement for a platform-level general-purpose access control policy. The only users that are required to have access to the platform are administrative users, and the policies that dictate their access are specified in other requirements (e.g., the FMT class).
T.UNIDENTIFIED_ACTIONS The administrator may fail to notice potential security violations, thus limiting the administrator's ability to identify and take action against a possible security breach.	O.AUDIT_REVIEW The TOE will provide the capability to selectively view audit information, and alert an administrator of identified potential security violations.	O.AUDIT_REVIEW (FAU_SAA.1-NIAP-0407, FAU_ARP.1, FAU_ARP_ACK_DIR_EXP.1, FAU_SAR.1(1)-(2), FAU_SAR.3) helps to mitigate this threat by providing a variety of mechanisms for monitoring the use of the system. The two basic ways audit review is performed is through analysis of the audit trail produced by the audit mechanism, and through the use of an automated analysis and alarm system. For analyzing the audit trail, the TOE requires an Auditor role. This role is restricted to Audit record review and the deletion of the audit trail for maintenance purposes. A search and sort capability provides an efficient mechanism for the Audit Administrator to view pertinent audit information. In addition to the local Auditor role, the TOE also has the capability to export the audit information to an external audit analysis tool (such as an intrusion detection system) for more detailed or composite audit analysis. The TOE's audit analysis mechanism must consist of a minimum set of configurable audit events that could

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		indicate a potential security violation. Thresholds for these events must be configurable by an appropriate administrative role. By configuring these auditable events, the TOE monitors the occurrences of these events (e.g. set number of authentication failures, set number directory access failures, self-test failures, etc.) and immediately notifies an administrator once an event has occurred or a set threshold has been met. If a potential security violation has been detected, the TOE displays a message that identifies the potential security violation to all administrative consoles. The consoles include the local TOE console and any active remote directory administrator sessions. If an administrator is not currently logged into the TOE, the message is stored and immediately displayed the next time an administrator logs into the TOE. This message is displayed and will remain on the screen until an administrator acknowledges the message. At this point, all administrators that have received the message will receive notification that the alarm has been acknowledged, who acknowledged the alarm, and the time that it was acknowledged. In addition to displaying the potential security violation, the message must contain all audit records that generated the potential security violation. By enforcing the message content and display, this objective provides assurance that a TOE administrator will be notified of a potential security violation.
T.UNKNOWN_STATE When the TOE is initially started or restarted after a failure, the security state of the TOE may be unknown.	O.MAINT_MODE The TOE shall provide a mode from which recovery or initial startup procedures can be performed. O.CORRECT_TSF_OPERATION The TOE will provide the capability to test the TSF to ensure the correct operation of the TSF at a customer's site. O.SOUND_DESIGN The design of the TOE will be the result of sound design principles and techniques; the design of the TOE, as well as the design principles and techniques, are adequately and accurately documented. O.ROBUST_ADMIN_GUIDANCE The TOE will provide administrators with the necessary information for secure delivery and management.	O.SOUND_DESIGN (ADV_SPM.1) works to mitigate this threat by requiring that the TOE developers provide accurate and complete design documentation of the security mechanisms in the TOE, including a security model. By providing this documentation, the possible secure states of the TOE are described, thus enabling the administrator to return the TOE to one of these states during the recovery process. O.MAINT_MODE (FPT_RCV.2-NIAP-0406) helps to mitigate this threat by ensuring that the TOE does not continue to operate in an insecure state when a hardware or software failure occurs. After a failure, the TOE enters a state that disallows operations and requires an administrator to follow documented procedures to return the TOE to a secure state. O.CORRECT_TSF_OPERATION (FPT_TST_EXP.4, FPT_TST._EXP.5) counters this threat by ensuring that the TSF runs a suite of tests to successfully demonstrate the correct operation of the TSF (hardware and software) and the TSF's cryptographic components at initial startup of the TOE. In addition to ensuring that the TOE's security state can be verified, an administrator can verify the integrity of the TSF's data and stored code as well as the TSF's cryptographic data and stored code using the TOE-provided cryptographic mechanisms. O.ROBUST_ADMIN_GUIDANCE (ADO_IGS.1, AGD_ADM.1) provides administrative guidance for the secure start-up of the TOE as well as guidance to configure and administer the TOE securely. This guidance provides administrators with the information necessary to ensure that the TOE is started and initialized in a secure manor. The

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		guidance also provides information about the corrective measure necessary when a failure occurs (i.e., how to bring the TOE back into a secure state).
P.ACCESS_BANNER The TOE shall display an initial banner describing restrictions of use, legal agreements, or any other appropriate information to which users consent by accessing the system.	**O.DISPLAY_BANNER** The TOE will display an advisory warning regarding use of the TOE.	O.DISPLAY_BANNER (FTA_TAB.1) satisfies this policy by ensuring that the TOE displays a Platform Administrator-configurable banner that provides all users with a warning about the unauthorized use of the TOE. This is required to be displayed before an interactive administrative session, since it does not make sense to display a banner for sessions involving directory requests from users, and those types of sessions are largely automated.
P.ACCOUNTABILITY The authorized users of the TOE shall be held accountable for their actions within the TOE.	**O.AUDIT_GENERATION** The TOE will provide the capability to detect and create records of security-relevant events associated with users. **O.AUDIT_PROTECTION** The TOE will provide the capability to protect audit information. **O.TIME_STAMPS** The TOE shall provide reliable time stamps and the capability for the administrator to set the time used for these time stamps. **O.ROBUST_TOE_ACCESS** The TOE will provide mechanisms that control a user's logical access to the TOE and to explicitly deny access to specific users when appropriate	O.AUDIT_GENERATION (FAU_GEN.1-NIAP-0410, FAU_GEN.2-NIAP-410, FIA_USB.1-NIAP-0351, FAU_SEL.1-NIAP-0407) addresses this policy by providing an audit mechanism to record the actions of a specific user, as well as the capability for an administrator to "pre-select" audit events based on the user ID. The audit event selection function is configurable during run-time to ensure the TOE is able to capture security-relevant events given changes in threat conditions. Additionally, the administrator's ID is recorded when any security relevant change is made to the TOE (e.g. access rule modification, start-stop of the audit mechanism, establishment of a trusted channel, etc.). Attributes used in the audit record generation process are also required to be bound to the subject, ensuring users are held accountable. O.AUDIT_PROTECTION (FAU.SAR.2, FAU_STG.1-NIAP-0429, FAU_STG.3, FAU_STG.NIAP-0429-1, FMT_SMF.1) address this policy by providing an archive of the audit data so an administrator can look at a complete history of audit data. O.TIME_STAMPS (FPT_STM.1, FMT_MTD.1(3)) plays a role in supporting this policy by requiring the TOE to provide a reliable time stamp (configured locally by the Platform Administrator or via a trusted IT entity, such as an NTP server). The audit mechanism is required to include the current date and time in each audit record. All audit records that include the user ID will also include the date and time that the event occurred. O.ROBUST_TOE_ACCESS (FIA_UID.2, FIA_UAU.2, FIA_UAU.5) supports this policy by requiring the TOE to identify and authenticate all authorized users prior to allowing any TOE access or any TOE mediated access on behalf of those users. Note that although the TSF allows access by anonymous users (FIA_UAU.1), this objective (and hence the policy) does not apply to such users because they are not authenticated.
P.ADMIN_ACCESS Administrators shall be able to administer the TOE both locally and remotely through protected communications channels.	**O.ADMIN_ROLE** The TOE will provide administrator roles to isolate administrative actions. **O.TRUSTED_PATH** The TOE will provide a means to ensure users are not communicating with some other entity pretending to be	O.ADMIN_ROLE (FMT_SMR.2(1)-(2)) supports this policy by requiring the TOE to provide mechanisms (e.g., local authentication, remote authentication, means to configure and manage the TOE both remotely and locally) that allow remote and local administration of the TOE. This is not to say that everything that can be done by a local administrator must also be provided to the remote

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	the TOE, and that the TOE is communicating with an authorized IT entity and not some other entity pretending to be an authorized IT entity.	administrator. In fact, it may be desirable to have some functionality restricted to the local administrator. O.TRUSTED_PATH (FTP_TRP.1(1), FTP_TRP.1(2), FTP_ITC.1(1), FTP_ITC.1(2)) satisfies this policy by requiring that each remote administrative and management session for all trusted users is authenticated and conducted via a secure channel. Additionally, all trusted IT entities (e.g., trusted peer directories, intrusion detection systems) connect through a protected channel, thus avoiding disclosure and spoofing problems. This objective works in conjunction with the IT environment objective, OE.TRUSTED_PATH, each providing one end of the trusted channel.
P.CRYPTOGRAPHY_VALIDATED Where the TOE requires FIPS-approved security functions, only NIST FIPS validated cryptography (methods and implementations) are acceptable for key management (i.e.; generation, access, distribution, destruction, handling, and storage of keys) and cryptographic services (i.e.; encryption, decryption, signature, hashing, key distribution, and random number generation services).	O.CRYPTOGRAPHY_VALIDATED The TOE shall use NIST FIPS 140-2 validated cryptomodules for cryptographic services implementing FIPS-approved security functions and random number generation services used by cryptographic functions.	O.CRYPTOGRAPHY_VALIDATED (FCS_BCM_EXP.1, FCS_CKM.1, FCS_COP_EXP.5, FCS_COP_EXP.6) implements this policy by requiring the TOE to implement NIST FIPS-validated cryptographic services. The objective requires that the functions needed by the TOE are FIPS approved, and further that they are available in a FIPS-approved mode of operation of the cryptomodule.
P.CRYPTOGRAPHIC_FUNCTIONS The TOE shall provide cryptographic functions for its own use, including encryption/decryption and digital signature operations.	O.CRYPTOGRAPHIC_FUNCTIONS The TOE shall provide cryptographic functions for its own use, including encryption/decryption and digital signature operations.	O.CRYPTOGRAPHIC_FUNCTIONS (FCS_CKM.1, FCS_CKM_EXP.2, FCS_CKM.4, FCS_COP_EXP.2, FCS_COP_EXP.3) implements this policy, requiring a combination of FIPS-validation and non-FIPS-validated cryptographic mechanisms that are used to provide encryption/decryption services, as well as digital signature functions. Functions include symmetric encryption and decryption, digital signatures, as well as key generation and establishment functions.
P.RATINGS_MAINTENANCE Procedures to maintain the TOE's rating must be in place, and these procedures must be implemented to maintain the TOE's rating once it is evaluated.	O.RATINGS_MAINTENANCE Procedures to maintain the TOE's rating will be documented and followed.	O.RATINGS_MAINTENANCE (AMA_AMP.1, AMA_CAT.1, AMA_EVD.1, AMA_SIA.1) satisfies this policy by ensuring that the TOE developer has procedures and mechanisms in place to maintain the evaluated rating that is ultimately awarded the TOE. The developer must provide a plan that identifies the certified version of the TOE and its life cycle process. Identifies any plans for new releases of the TOE to include a description of the changes included in the new release and a security impact analysis of implementing the new changes. Assign and identify the TOE's developer security analyst and ensure that they follow documented procedures. TOE components must be categorized by security relevance. The categorization scheme must be documented and followed for changes to the TOE.
P.DISTRIBUTED_DIRECTORY_SUPPORT Directories shall be able to support replication and chaining functions. To support replication directories shall be able to replicate (both produce and consume) definable subtrees to other directories (a source and a discoursia)	O.DISTRIBUTED_DIRECTORY_SUPPORT The TSF shall be able to replicate definable subtrees to (produce) and accept replications of definable subtrees from (consume) other directories. The TSF shall be to authenticate using 3rd party introduction and 3rd party presentation for chaining.	O.DISTRIBUTED_DIRECTORY_SUPPORT (FDD_RPL_EXP.1, FIA_UAU.5, FPT_SEP.2-NIAP-0424, FTP_ITC.1(1) FTP_ITC.1(2)) implements the policy by providing the replication service. This service allows replication of subtrees, as well as the ability for the TSF to either produce or consume the replicated data. Security attributes are associated with the replicated data to ensure a consistent

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directories (peer trusted directories). Directories shall be able to support 3rd party authentication mechanisms for chaining.		enforcement of the security policy. The policy is also implemented by the TSF authentication mechanisms 3rd party introduction and 3rd party presentation. In addition, the TOE can be trusted to be the introducer or presenter to a peer directory by ensuring the integrity and confidentiality of the user authentication data.
P.NONREPUDIATION The TOE must provide non-repudiation services for transmitted and received DIB data. The non-repudiation services include both the generation and verification of evidence for non-repudiation, including a timestamp, and notification that evidence of receipt the TOE is waiting for is overdue. The TOE must also provide a 'verifiable journal of entries', which is a record of the history of changes to an entry or attribute in the DIB and provide evidence that the entry or attribute is valid.	O.NONREPUDIATION At the option of an administrator, the TSF must be able to provide non-repudiation services for transmitted and received DIB data. These services must include both the generation and verification of evidence for non-repudiation, including a timestamp, and notification that the evidence of receipt the TOE is waiting for is overdue. At the option of an administrator, the TSF must also be able to keep a 'verifiable journal of updates' for any entry or attribute in the directory, and provide evidence that the entry or attribute is valid.	There are two non-repudiation policies that are required: one for individual DIB entries, and one for data that are replicated (FDD_RPL_EXP.1) O.NONREPUDIATION (FDD_DAU_EXP.1) implements the first policy by requiring that the cryptographic functions of the TSF be used to implement the validity guarantee. The evidence of validity also must be maintainable in a history list. Finally, this evidence must be made available to all users of the directory so that they have the capability to verify the validity of the entry. It is important to note that the policy requires that the capability exists, but not that it is "always on". An administrator will determine what entries (out of the set of all entries) will have this mechanism applied (FMT_MOF.1(1)). This objective (FCO_NRO_EXP.1, FCO_NRR_EXP.1) also supplies the non-repudiation mechanism on both origin (when the TSF is acting as the producer) and receipt (when the TSF is acting as the consumer) of the replicated directory information.
P.VULNERABILITY_ ANALYSIS_TEST The TOE must undergo appropriate independent vulnerability analysis and penetration testing to demonstrate that the TOE is resistant to an attacker possessing a medium attack potential.	O.VULNERABILITY_ANALYSIS_ TEST The TOE will undergo appropriate independent vulnerability analysis and penetration testing to demonstrate the design and implementation of the TOE does not allow attackers with medium attack potential to violate the TOE's security policies.	O.VULNERABILITY_ANALYSIS_TEST (AVA_VLA.3) satisfies this policy by ensuring that an independent analysis is performed on the TOE and penetration testing based on that analysis is performed. Having an independent party perform the analysis helps ensure objectivity and eliminates preconceived notions of the TOE's design and implementation that may otherwise affect the thoroughness of the analysis. The level of analysis and testing requires that an attacker with a moderate attack potential cannot compromise the TOE's ability to enforce its security policies.

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6.2 RATIONALE FOR THE SECURITY OBJECTIVES AND SECURITY FUNCTIONAL REQUIREMENTS FOR THE ENVIRONMENT

All but one of the security objectives for the environment, OE.TRUSTED_PATH, are restatements of an assumption found in Section 3. Therefore, those security objectives for the environment trace to the assumptions trivially.

The IT security objective OE.TRUSTED_PATH(FTP_TRP.1(1), FTP_TRP.1(2), FTP_ITC.1(1), FTP_ITC.1(2)) is necessary to satisfy the policy P.ADMIN_ACCESS. This IT security objective for the environment works in conjunction with the TOE security objective O.TRUSTED_PATH, each providing one end of a trusted channel, to ensure there is a trusted communications channel for remote administrative and management sessions for all trusted users and authorized IT entities (e.g., trusted peer directories, intrusion detection system), thus avoiding disclosure and spoofing problems.

6.3 RATIONALE FOR TOE SECURITY REQUIREMENTS

Table 6.2 – Rationale for TOE Security Requirements

Objective	Requirements Addressing the Objective	Rationale
O.ROBUST_ADMIN_GUIDANCE The TOE will provide administrators with the necessary information for secure delivery and management.	ADO_DEL.2 AGD_ADM.1 AVA_MSU.2 ADO_IGS.1 AGD_USR.1	ADO_DEL.2 ensures that the administrator is provided documentation that instructs them how to ensure the delivery of the TOE, in whole or in parts, has not been tampered with or corrupted during delivery. This requirement ensures the administrator has the ability to begin their TOE installation with a *clean* (e.g., malicious code has not been inserted once it has left the developer's control) version of the TOE, which is necessary for secure management of the TOE. The ADO_IGS.1 requirement ensures the administrator has the information necessary to install the TOE in the evaluated configuration. Often times a vendor's product contains software that is not part of the TOE and has not been evaluated. The Installation, Generation and Startup (IGS) documentation ensures that once the administrator has followed the installation and configuration guidance the result is a TOE in a secure configuration. The AGD_ADM.1 requirement mandates the developer provide the administrator with guidance on how to operate the TOE in a secure manner. This includes describing the interfaces the administrator uses in managing the TOE, security parameters that are configurable by the administrator, how to configure the TOE's ruleset and the implications of any dependencies of individual rules. The documentation also provides a description of how to setup and review the auditing features of the TOE. The AGD_USR.1 is intended for non-administrative users, but could be used to provide guidance on security that is common to both administrators and non-administrators (e.g., password management guidelines). Since the non-administrative users of this TOE are limited to relying parties it is expected that the user guidance would discuss how the data validation (FDD_DAU_EXP.1) authentication mechanism is used, and any instructions on authenticating to the TOE. The description of the

Objective	Requirements Addressing the Objective	Rationale
		use of these mechanisms would not have to be repeated in the administrator's guide. AVA_MSU.2 ensures that the guidance documentation is complete and can be followed unambiguously to ensure the TOE is not misconfigured in an insecure state due to confusing guidance.
O.ADMIN_ROLE The TOE will provide administrator roles to isolate administrative actions.	FMT_SMR.2(1) FMT_SMR.2(2)	FMT_SMR.2 requires that four roles exist for administrative actions: the Security Administrator, who is responsible for configuring most security-relevant parameters on the TOE; the Cryptographic Administrator, who is responsible for managing the security data that is critical to the cryptographic operations; the Auditor, who is responsible for reading and deleting the audit trail; and one or more directory managers, who is able to perform directory operations on some portion of the directory hierarchy. The security administrator defines a directory manager's scope of control. The TSF is able to associate a human user with one or more roles and these roles isolate administrative functions in that the functions of these roles do not overlap (except for the directory manager roles, discussed below). It is true that the design of some systems could enable a rogue security administrator to manipulate cryptographic data by, for instance, writing directly to kernel memory. While this scenario is a security concern, this objective does not counter that aspect of T.ADMIN_ROGUE. If a security administrator were to perform such an action, the auditing requirements (along with the audit trail protection requirements) afford some measure of detectability of the rogue platform administrator's actions. The manager roles, unlike the roles in FMT_SMR.2(1), are not required to have totally isolated functions. Instead, each directory manager will have a subset of the functionality, as well as a subset of the scope of control, of the security administrator. Thus, if the directory manager is the rogue admin, the damage will be isolated to the portion of the directory hierarchy over which the directory manager has control, and will likely not affect the rest of the directory. The security administrator, as mentioned above, is responsible for defining the scope of control for the directory managers.
O.AUDIT_GENERATION The TOE will provide the capability to detect and create records of security-relevant events associated with users.	FAU_GEN.1-NIAP-0410 FAU_GEN.2-NIAP-0410 FIA_USB.1-NIAP-0351 FAU_SEL.1-NIAP-0407	FAU_GEN.1-NIAP-0410 defines the set of events that the TOE must be capable of recording. This requirement ensures that an administrator has the ability to audit any security relevant event that takes place in the TOE. This requirement also defines the information that must be contained in the audit record for each auditable event. There is a minimum of information that must be present in every audit record and this requirement defines that, as well as the additional information that must be recorded for each auditable event. This requirement also places a requirement on the level of detail that is recorded on any additional security functional requirements an ST author adds to this PP. FAU_GEN.2-NIAP-410 ensures that the audit records associate a user identity with the auditable event. Although the FIA_ATD.1(*) requirements mandate that a "userid" be used to represent a user identity, the TOE developer is able to associate different types of userids with different users in order to meet this objective. FAU_SEL.1-NIAP-0407 allows the selected administrator(s) to configure which auditable events will be recorded in the audit trail. This provides the administrator with the flexibility in

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		recording only those events that are deemed necessary by site policy, thus reducing the amount of resources consumed by the audit mechanism and providing the ability to focus on the actions of an individual user. In addition, the requirement has been refined to require that the audit event selection function is configurable during run-time to ensure the TOE is able to capture security-relevant events given changes in threat conditions. FIA_USB.1 plays a role is satisfying this objective by requiring a binding of security attributes associated with users that are authenticated with the subjects that represent them in the TOE. This only applies to authenticated users, since the identity of unauthenticated users cannot be confirmed. Therefore, the audit trail may not always have the proper identity of the subject that causes an audit record to be generated (anonymous relying parties).
O.AUDIT_PROTECTION The TOE will provide the capability to protect audit information.	FAU_STG.1-NIAP-0429 FAU_SAR.2 FAU_STG.NIAP-0429-1 FAU_STG.3 FMT_SMF.1	FAU_SAR.2 restricts the ability to read the audit trail to the Auditor, thus preventing the disclosure of the audit data to any other user. However, the TOE is not expected to prevent the disclosure of audit data if it has been archived or saved in another form (e.g., moved or copied to an ordinary file). The FAU_STG family dictates how the audit trail is protected. FAU_STG.1-NIAP-0429 restricts the ability to delete audit records to the Auditor; or if the option of overwriting old audit records is chosen by the Platform/Directory Administrator in FAU_STG.NIAP-0429-1, the audit data may be deleted/overwritten. Since the auditor is trusted to review the audit data, the threat being countered is that the platform/directory administrator does something malicious and then attempts to conceal it by configuring the audit log to overwrite old records. Presumably the platform/directory administrator would then attempt to fill up the audit log in order to overwrite the thing they just did, as well as the fact that the they reconfigured the audit log overwrite action. The auditor would hopefully notice this activity and detect the fact that the platform/directory administrator was performing illicit activities. The fact that the platform/directory administrator does not directly have the ability to delete the audit records helps ensure that audit records are kept until the Auditor deems they are no longer necessary. FAU_STG.1-NIAP-0429 also ensures that no one has the ability to modify audit records (e.g., edit any of the information contained in an audit record). This ensures the integrity of the audit trail is maintained. FAU_STG.3 requires that the administrators be alerted when the audit trail exceeds a capacity threshold established by the Security Administrator. In addition, an audit record is cut which will trigger the analysis performed in FAU_SAA, resulting in an FAU_ARP alarm being issued. This ensures that an administrator has the opportunity to manage the audit trail before it becomes full and the avoiding the possible loss of audit data. FAU_STG.NIAP-0429-1 allows the Security Administrator to configure the TOE so that if the audit trail does become full, either the TOE will prevent any events from occurring (other than actions taken by the administrator) that would generate an audit record or the audit mechanism will overwrite the oldest audit records with new records. FMT_SMF.1 requires the TOE to provide an administrator with a facility to backup, recover and archive audit data ensuring the ability to recover corrupted audit records, and access to a complete history of audit information.

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O.AUDIT_REVIEW The TOE will provide the capability to selectively view audit information, and alert the administrator of identified potential security violations.	FAU_SAA.1-NIAP-0407 FAU_ARP.1 FAU_ARP_ACK_DIR_EXP.1 FAU_SAR.3 FAU_SAR.1(1) FAU_SAR.1(2)	FAU_SAA.1-NIAP-0407 defines the events (or rules) that indicate a potential security violation and will generate an alarm. The triggers for these events are largely configurable by the Security Administrator. Some rules are not configurable, or configurable by the cryptographic administrator. FAU_ARP.1 requires that the alarm be displayed at the local administrative console and at the remote administrative console(s) when auditor and security administrative session(s) exists. For alarms at remote consoles, the alarm is sent either during an established session or upon session establishment (as long as the alarm has not been acknowledged). This is required to increase the likelihood that the alarm will be received as soon as possible. This requirement also dictates the information that must be displayed with the alarm. The potential security violation is identified in the alarm, as are the contents of the audit records of the events that accumulated and triggered the alarm. The information in the audit records is necessary it allows the administrators to react to the potential security violation without having to search through the audit trail looking for the related events. FAU_ARP_ACK_EXP.1 requires that an alarm generated by the mechanism that implements the FAU_ARP requirement be maintained until an administrator acknowledges it. This ensures that the alarm message will not be obstructed and the administrators will be alerted of a potential security violation. Additionally, this requires that the acknowledgement be transmitted to users that received the alarm, thus ensuring that that set of administrators knows that the user specified in the acknowledgement message has addressed the alarm. FAU_SAR.1 (both iterations) is used to provide both the auditor and an external audit analysis function the capability to read all the audit data contained in the audit trail. This requirement also mandates the audit information be presented in a manner that is suitable for the end user (auditor or external system) to interpret the audit trail. It is expected that the audit information be presented in such a way that the end user can examine an audit record and have the appropriate information (that required by FAU_GEN.2-NIAP-410) presented together to facilitate the analysis of the audit review. Ensuring the audit data are presented in an interpretable format will enhance the ability of the entity performing the analysis to identify potential security violations. FAU_SAR.3 complements FAU_SAR.1 by providing the administrators the flexibility to specify criteria that can be used to search or sort the audit records residing in the audit trail. FAU_SAR.3 requires the administrators be able to establish the audit review criteria based on a userid and role so that the actions of a user can be readily identified and analyzed. Allowing the administrators to perform searches or sort the audit records based on dates and times provides the capability to facilitate the administrator's review of incidents that may have taken place at a certain time. It is important to note that the intent of sorting in this requirement is to allow the administrators the capability to organize or group the records associated with a given criteria.
O.CHANGE_MANAGEMENT The configuration of, and all changes to, the TOE and its development evidence will be analyzed, tracked, and controlled throughout the TOE's development.	ACM_CAP.4 ACM_SCP.2 ALC_DVS.1 ALC_FLR.2	ACM_CAP.4 contributes to this objective by requiring the developer have a configuration management plan that describes how changes to the TOE and its evaluation deliverables are managed. The developer is also required to employ a configuration management system that operates in accordance with the CM plan and provides the capability to control who on the development staff can make changes to the TOE and its developed evidence. This requirement also ensures that authorized

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	ALC_LCD.1 ACM_AUT.1	changes to the TOE have been analyzed and the developer's acceptance plan describes how this analysis is performed and how decisions to incorporate the changes to the TOE are made. ACM_SCP.2 is necessary to define what items must be under the control of the CM system. This requirement ensures that the TOE implementation representation, design documentation, test documentation (including the executable test suite), user and administrator guidance, CM documentation and security flaws are tracked by the CM system. ALC_DVS.1 requires the developer describe the security measures they employ to ensure the integrity and confidentiality of the TOE are maintained. The physical, procedural, and personnel security measures the developer uses provides an added level of control over who and how changes are made to the TOE and its associated evidence. ALC_FLR.2 plays a role in satisfying the "analyzed" portion of this objective by requiring the developer to have procedures that address flaws that have been discovered in the product, either through developer actions (e.g., developer testing) or those discovered by others. The flaw remediation process used by the developer corrects any discovered flaws and performs an analysis to ensure new flaws are not created while fixing the discovered flaws. ALC_LCD.1 requires the developer to document the life-cycle model used in the development and maintenance of the TOE. This life-cycle model describes the procedural aspects regarding the development of the TOE, such as design methods, code or documentation reviews, how changes to the TOE are reviewed and accepted or rejected. ACM_AUT.1 complements ACM_CAP.4, by requiring that the CM system use an automated means to control changes made to the TOE. If automated tools are used by the developer to analyze, or track changes made to the TOE, those automated tools must be described. This aids in understanding how the CM system enforces the control over changes made to the TOE.
O.CORRECT_ TSF_OPERATION The TOE will provide the capability to test the TSF to ensure the correct operation of the TSF at a customer's site.	FPT_TST_EXP.4 FPT_TST_EXP.5	O_CORRECT_TSF_OPERATION requires two explicit functional requirements: FPT_TST_EXP.4 for portions of the TOE that are not related to cryptographic functionality, and FTP_TST_EXP.5 for those that are. These functional requirements provide the end user with the capability to ensure the TOE's security mechanisms continue to operate correctly in the field. From the perspective of non-cryptographic hardware and software, FPT_TST_EXP.4 provides the necessary functionality. The first element ensures end user tests exist to demonstrate the correct operation of the security mechanisms required by the TOE that is provided by the hardware. Hardware failures could render a TOE's software ineffective in enforcing its security policies and this requirement provides the end user the ability to discover any failures in the hardware security mechanisms. If TSF software is corrupted it is possible that the TSF would no longer be able to enforce the security policies. This also holds true for TSF data; if TSF data are corrupt the TOE may not correctly enforce its security policies. Some TSF data, however, is always changing (for instance, a file containing audit records) and therefore is not suitable for integrity checking mechanisms. These data are identified so that the administrator can understand the limitations

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		of the mechanism. In order to protect the TSF code and data, the second and third elements require the use of a cryptographic mechanism to ensure that the TSF data, as well as the executable TSF code, have not been corrupted. FPT_TST_EXP.5 addresses the critical nature and specific handling of the cryptographic-related TSF mechanisms. The cryptomodules have self-tests that are validated as part of the FIPS 140-2 process; this requirement ensures that those tests are invoked commensurate with the requirements on self-tests for other parts of the TOE. Additionally, because key material is critical to the security provided by cryptographic mechanisms, the TSF is required to provide a capability to run the self-tests after generation of a key to help ensure that an undetected failure did not compromise the integrity of the key that was just generated.
O.CRYPTOGRAPHY_VALIDATED The TOE shall use NIST FIPS 140-2 validated cryptomodules for cryptographic services implementing FIPS-approved security functions and random number generation services used by cryptographic functions.	FCS_BCM_EXP.1 FCS_CKM.1 FCS_COP_EXP.5 FCS_COP_EXP.6	This objective deals with the issue of using FIPS 140-2-approved cryptomodules in the TOE. A cryptomodule, as used in the components, is a module that is FIPS 140-2 validated (in accordance with FCS_BCM_EXP.1); the cryptographic functionality implemented in that module are FIPS-approved security functions that have been validated; and the cryptographic functionality is available in a FIPS-approved mode of the cryptomodule. This objective is distinguished from O.CRYPTOGRAPHIC_FUNCTIONALITY in that this deals only with a requirement to use FIPS 140-2-validated cryptomodules where the TOE requires such functionality; it does not dictate the specific functionality that is to be used. FCS_BCM_EXP.1 is an explicit requirement that specifies not only that cryptographic functions that are FIPS-approved must be validated by FIPS, but also what NIST FIPS rating level the cryptographic module must satisfy. The level specifies the degree of testing of the module. The higher the level, the more extensive the module is tested. FCS_CKM.1 mandates that the cryptomodule must generate key, and that this key generation must be part of the FIPS-validated cryptomodule. FCS_COP_EXP.5 and FCS_COP_EXP.6 are similar in that they require that any random number generation and hashing functions, respectively, are part of a FIPS-validated cryptographic module. These requirements do not mandate that the functionality is generally available, but only that it be implemented in a FIPS-validated module should other cryptographic functions need these services.
O.CRYPTOGRAPHIC_FUNCTIONS The TOE shall provide cryptographic functions for its own use, including encryption/decryption and digital signature operations.	FCS_CKM.1 FCS_CKM_EXP.2 FCS_CKM.4 FCS_COP_EXP.2 FCS_COP_EXP.3	In contrast to O.CRYPTOGRAPHY_VALIDATED, this objective is to provide cryptographic functionality that is used by the TOE. The core functionality to be supported is encryption/decryption using a symmetric algorithm, and digital signature generation and verification using asymmetric algorithms. Since these operations involve cryptographic keys, how the keys are generated and/or otherwise obtained have to also be specified. FCS_CKM.1 is a requirement that a cryptomodule generate symmetric keys. Such keys are used by the AES encryption/decryption functionality specified in FCS_COP_EXP.2. Another way of obtaining key material for symmetric algorithms is through cryptographic key establishment, as specified in FCS_CKM_EXP.2. Key establishment has two aspects: key agreement and key distribution. Key agreement occurs when two entities exchange public data yet arrive at a mutually shared key

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		without ever passing that key between the two entities (for example, the Diffie-Hellman algorithm). Key distribution occurs when the key is transmitted from one entity to the TOE. If the entity is electronic and a protocol is used to distribute the key, it is referred to in this PP as "Key Transport". If the key is loaded into the TOE it can be loaded electronically (e.g., from a floppy drive, smart card, or electronic keyfill device) or manually (e.g., typed in). One or more of these methods must be selected. FCS_CKM.4 provides the functionality for ensuring key and key material is zeroized. This applies not only to key that resides in the TOE, but also to intermediate areas (physical memory, page files, memory dumps, etc.) where key may appear. As previously mentioned FCS_COP_EXP.2 specifies that AES be used to perform encryption and decryption operations. FCS_COP_EXP.3 gives two options for providing the digital signature capability; these requirements also contain requirements for obtaining and generating the domain parameters and key for each of the algorithms.
O.DISPLAY_BANNER The TOE will display an advisory warning regarding use of the TOE.	FTA_TAB.1	FTA_TAB.1 meets this objective by requiring the TOE display a Platform Administrator-defined banner before an administrator can establish an interactive session. This banner is under complete control of the Platform Administrator in which they specify any warnings regarding unauthorized use of the TOE and remove any product or version information if they desire.
O.DOCUMENT_KEY_ LEAKAGE The bandwidth of channels that can be used to compromise key material shall be documented.	AVA_CCA_EXP.2	AVA_CCA_EXP.2 requires that a covert channel analysis be performed on the entire TOE to determine the bandwidth of possible cryptographic key leakage. While there are no requirements to limit the bandwidth, the results of this analysis will provide useful guidance on what the specified lifetime of the cryptographic keys should be in order to reduce the damage due to a key compromise.
O.THOROUGH_FUNCTIONAL_TESTING The TOE will undergo appropriate security functional testing that demonstrates the TSF satisfies the security functional requirements.	ATE_COV.2 ATE_FUN.1 ATE_DPT.2 ATE_IND.2	In order to satisfy O.THOROUGH_FUNCTIONAL_ TESTING, the ATE class of requirements is necessary. The component ATE_FUN.1 requires the developer to provide the necessary test documentation to allow for an independent analysis of the developer's security functional test coverage. In addition, the developer must provide the test suite executables and source code, which are used for independently verifying the test suite results and in support of the test coverage analysis activities. ATE_COV.2 requires the developer to provide a test coverage analysis that demonstrates the TSFI are completely addressed by the developer's test suite. While exhaustive testing of the TSFI is not required, this component ensures that the security functionality of each TSFI is addressed. This component also requires an independent confirmation of the completeness of the test suite, which aids in ensuring that correct security relevant functionality of a TSFI is demonstrated through the testing effort. ATE_DPT.2 requires the developer to provide a test coverage analysis that demonstrates depth of coverage of the test suite. This component complements ATE_COV.2 by ensuring that the developer takes into account the high-level and low-level design when developing their test suite. Since exhaustive testing of the TSFI is not required, ATE_DPT.2 ensures that subtleties in TSF behavior that are not readily apparent in the functional specification are addressed in the test suite. ATE_IND.2 requires an independent confirmation of the developer's test results, by mandating a subset of the test suite be run by an independent party. This component also requires an independent party to attempt to craft functional tests that address functional behavior that is not demonstrated in

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		the developer's test suite. Upon successful adherence to these requirements, the TOE's conformance to the specified security functional requirements will have been demonstrated.
O.MAINT_MODE The TOE shall provide a mode from which recovery or initial startup procedures can be performed.	FPT_RCV.2-NIAP-0406	This objective is met by using the FPT_RCV.2-NIAP-0406 requirement, which ensures that the TOE does not continue to operate in an insecure state when a hardware or software failure occurs. Upon the failure of the TSF self-tests the TOE will no longer be assured of enforcing its security policies. Therefore, the TOE enters a state that operations and requires an administrator to follow documented procedures that instruct them on to return the TOE to a secure state. These procedures may include running diagnostics of the hardware, or utilities that may correct any integrity problems found with the TSF data or code. Solely specifying that the administrator reload and install the TOE software from scratch, while might be required in some cases, does not meet the intent of this requirement.
O.MANAGE The TOE will provide all the functions and facilities necessary to support the administrators in their management of the security of the TOE, and restrict these functions and facilities from unauthorized use.	FMT_MSA.1 FMT_MOF.1(1) FMT_MOF.1(2) FMT_MTD.1(1) FMT_MTD.1(2) FMT_MTD.1(3) FMT_MTD.1(4) FMT_MTD.2(1) FMT_MTD.2(2) FMT_SMF.1	The FMT requirements are used to satisfy this management objective, as well as other objectives that specify the control of functionality. The requirement's rationale for this objective focuses on the administrator's capability to perform management functions in order to control the behavior of security functions. FMT_MSA.1 provides the Security Administrator or Directory Manager the capability to manipulate the security attributes of the objects in their scope of control that determine the access policy for directory objects. There are several functions in the TSF that need to be enabled or disabled: the ability to provide verification evidence for certain directory objects; the ability to replicate portions of the directory, either in a producer role or a consumer role; the ability to detect attempts to replay operations sent by a relying party; and the ability to enable the cryptographic module self-tests to be run after generation of a key. The use of these functions is specified and restricted by the FMT_MOF.1 iterations. The requirement FMT_MTD.1(1) is intended to be used by the ST author, with possible iterations, to address TSF data that has not already been specified by other FMT requirements. This is necessary because the ST author may add TSF data in assignments that cannot be addressed ahead of time by the PP authors. This requirement specifies that the manipulation of these data be restricted to the security administrator. FMT_MTD.1(2) provides the Cryptographic Administrator, and only the Cryptographic Administrator, the ability to modify the cryptographic security data. This allows the Cryptographic Administrator to change the critical data that affects the TOE's ability to perform its cryptographic functions properly. FMT_MTD.1(3) provides the capability of setting the date and time that is used to generate time stamps to the Security Administrator or a trusted IT entity (authorized data manager). It is important to allow this functionality, due to clock drift and other circumstances, but the capability must be restricted. A trusted IT entity is allowed in the selection made by the ST author to take in account the use of an NTP server or some other service that provides time information without human intervention. FMT_MTD.1(4) addresses the capabilities of data managers, who have responsibilities for security data management for sub-portions of the set of TSF data (for example, the platform clock time, sub-hierarchies of the directory). The scope of a data manager's responsibility is set by a security administrator, but

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		they are expected to manage the entities in their scope of control without reliance on the security administrator.
		FMT_MTD.2(1), FMT_MTD.2(2) restrict the setting of limits on the processor time and network connection resources, respectively, to an administrator. This capability allows an administrator to control the resources consumed by to provide a flexible policy with respect to denial of service attacks.
		FMT_SMF.1 requires the TOE to provide a backup and restore capability for administrators to use to enable recovery of TSF data.
O.MEDIATE The TOE must protect user data in accordance with its security policy.	FDP_ACC.2 FDP_ACF.1	The FDP_ACC.2 and FDP_ACF.1 requirements were chosen to define the policies, the subjects, objects, and operations for how and when mediation of access to the directory takes place. Because of the A.NO_GENERAL_PURPOSE assumption the no access control policy (for relying parties) needs to be defined for platform resources.
		FDP_ACC.2 specifies that the subjects under control of the policy are directory managers and relying parities, and that all operations that involve access to (minimally) the DIB entries, DIB attributes, and DIB attribute values are controlled by the policy. These objects contain the user data to be protected.
		FDP_ACF.1 details the manner in which the user data are to be protected. The basics called for by the requirement is to match a set of attributes associated with a subject to a set of "access control items" associated with the object they wish to access; all applicable ACIs need to grant access in order for the subject to perform the operation on the object. The details of how the ACIs are collected and the specific operations supported are specified in the ST, and with the attributes define the security policy to be enforced. Setting the attributes (implementing the security policy) is a function of the directory administrator or directory manager.
O.RATINGS_MAINTENANCE Procedures to maintain the TOE's rating will be documented and followed.	AMA_AMP.1 AMA_CAT.1 AMA_EVD.1 AMA_SIA.1	The AMA family of requirements is incorporated into this PP to ensure the TOE developer has procedures and mechanisms in place to maintain the evaluated rating that is ultimately awarded the TOE. These requirements are somewhat related to the ACM family of requirements in that changes to the TOE and its evidence must be managed, but the AMA requirements ensure the appropriate level of analysis is performed on any changes made to the TOE to ensure the changes do not affect the TOE's ability to enforce its security policies.
		AMA_AMP.1 requires the developer to develop an assurance maintenance (AM) plan that describes how the assurance gained from an evaluation will be maintained, and that any changes to the TOE will be analyzed to determine the security impact, if any, of the changes that are made. This requirement mandates the developer assign personnel to fulfill the role of a security analyst that is responsible for ensuring the changes made to the TOE will not adversely impact the TOE and that it will continue to maintain its evaluation rating.
		AMA_CAT.1 is used to focus the security analyst's scope in analyzing the changes made to the TOE. Components of the TOE are categorized according to the components security relevance in the TOE. For example, a TOE that conforms to this PP might have a component such as a scheduler that is deemed to play no role in satisfying the security requirements and therefore would not get a lot of attention from the security analyst. On the other hand, the network stack plays an important role in providing an interface to

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		the TSF, and would require a great deal of scrutiny by the analyst. AMA_EVD.1 ensures that the developer is following the AM plan by requiring the developer to provide evidence. This is an important component in assuring that the procedures required by AMA_AMP.1 are pertinent to the maintenance of the TOE's rating. AMA_SIA.1 plays an important role in satisfying this objective by requiring the developer's security analyst to document any modifications (or additions) to the TOE that affect the enforcement of the TOE's security policies. Additionally, the evidence required documents the analysis performed by the analyst and provides a degree of confidence that the appropriate level of analysis was performed and the continued evaluation rating of the new version of the TOE is warranted.
O.REPLAY_DETECTION The TOE will provide a means to detect and reject the replay of authentication data.	FPT_RPL.1	The O.REPLAY_DETECTION objective is satisfied by FPT_RPL.1(1), which requires the TOE to detect and reject the attempted replay of authentication data from a remote user (administrator or relying party). This is sufficient to meet the objective because no untrusted users have local access to the TOE, thus there is no way to capture nor replay authentication data for a local session.
O.RESIDUAL_INFORMATION The TOE will ensure that any information contained in a protected resource is not released when the resource is reallocated.	FDP_RIP.2	FDP_RIP.2 is used to ensure the contents of resources are not available to subjects other than those explicitly granted access to the data. For this TOE it is critical that the memory used to build network packets containing replies to relying party requests is either cleared or that some buffer management scheme be employed to prevent the contents of a packet being disclosed in a subsequent packet (e.g., if padding is used in the construction of a packet, it must not contain another user's data or TSF data).
O.RESOURCE_SHARING The TOE shall provide mechanisms that mitigate attempts to exhaust CPU time and available network connections provided by the TOE.	FRU_RSA.1(1) FRU_RSA.1(2) FMT_MTD.2(1) FMT_MTD.2(2)	While an availability security policy does not explicitly exist, FRU_RSA.1 is used to mitigate potential resource exhaustion attempts. In order to mitigate the CPU exhaustion attempt, FRU_RSA.1(1) is included. This requires that the CPU time being consumed by a relying party must be limited to an amount specified by the security administrator (FMT_MTD.2(1)), and actions taken when an attempt is made are specified in FMT_MTD.2(1). This requirement takes into account all CPU resources being consumed by a user (relying party), and not just a single subject. FRU_RSA.1(2) was used to reduce the impact of an attempt being made to exhaust transport-layer representation implementation artifacts (e.g., the TCP "half-open connection" attack). This requirement indicates that a time period must exist when maximum quota (which is defined by the ST) is met or surpassed. Although this requirement (unlike the two previous requirements) does not mandate that the administrator be able to set this time period, FMT_MTD.2(2) restricts this functionality should the TOE implement it. FMT_MTD.2(2) also indicates (when filled in by the ST author) what action is to be taken when the quota is reached.
O.SELF_PROTECTION The TSF will maintain a domain for its own execution that protects itself and its resources from external interference, tampering, or unauthorized disclosure.	FPT_SEP.2-NIAP-0424 FPT_RVM.1	FPT_SEP was chosen to ensure the TSF provides a domain that protects itself from untrusted users. If the TSF cannot protect itself it cannot be relied upon to enforce its security policies. FPT_SEP.1 could have been used to address the previous notion, however, FPT_SEP.2-NIAP-0424 was used to require that the *cryptographic module* be provided its own address space. This is

Objective	Requirements Addressing the Objective	Rationale
		necessary to reduce the impact of programming errors in the remaining portions of the TSF on the cryptographic module. The inclusion of FPT_RVM.1 ensures that the TSF makes policy decisions on all interfaces that perform operations on subjects and objects that are scoped by the policies. Without this non-bypassability requirement, the TSF could not be relied upon to completely enforce the security policies, since an interface(s) may otherwise exist that would provide a user with access to TOE resources (including TSF data and executable code) regardless of the defined policies. This includes controlling the accessibility to interfaces, as well as what access control is provided within the interfaces.
O.SOUND_DESIGN The design of the TOE will be the result of sound design principles and techniques; the design of the TOE, as well as the design principles and techniques, are adequately and accurately documented.	ADV_FSP.2 ADV_HLD.2 ADV_INT.1 ADV_LLD.1 ADV_RCR.1 ADV_SPM.1	There are two different perspectives for this objective. One is from the developer's point of view and the other is from the evaluator's. The ADV class of requirements is levied to aide in the understanding of the design for both parties, which ultimately helps to ensure the design is sound. ADV_INT.1 ensures that the design of the TOE has been performed using good software engineering design principles that require a modular design of the TSF. Modular code increases the developer's understanding of the interactions within the TSF, which in turn, potentially reduces the amount of errors in the design. Having a modular design is imperative for evaluator's to gain an appropriate level of understanding of the TOE's design in a relatively short amount of time. The appropriate level of understanding is dictated by other assurance requirements in this PP (e.g., ATE_DPT.2, AVA_CCA_EXP.2, AVA_VLA.3). ADV_SPM.1 requires the developer to provide an informal model of the security policies of the TOE. Modeling these policies helps understand and reduce the unintended side effects that occur during the TOE's operation that might adversely affect the TOE's ability to enforce its security policies. ADV_FSP.2 requires that the interfaces to the TSF be completely specified. In this TOE, a complete specification of the network interface (including the network interface card) is critical in understanding what functionality is presented to untrusted users and how that functionality fits into the enforcement of security policies. Some network protocols have inherent flaws and users have the ability to provide the TOE with network packets crafted to take advantage of these flaws. The routines/functions that process the fields in the network protocols allowed (e.g., TCP, UPD, ICMP, directory-specific protocols such as LDAP) must fully specified: the acceptable parameters, the errors that can be generated, and what, if any, exceptions exist in the processing. The functional specification of the hardware interface (e.g., network interface card) is also extremely critical. Any processing that is externally visible performed by NIC must be specified in the functional specification. Having a complete understanding of what is available at the TSF interface allows one to analyze this functionality in the context of design flaws. ADV_HLD.2 requires that a high-level design of the TOE be provided. This level of design describes the architecture of the TOE in terms of subsystems. It identifies which subsystems are responsible for making and enforcing security relevant (e.g., anything relating to an SFR) decisions and provides a description, at a high level, of how those decisions are made and enforced. Having this level of description helps provide a general understanding of how the TOE works, without getting buried in details, and may allow the reader to discover flaws in the design.

Objective	Requirements Addressing the Objective	Rationale
		The low-level design, as required by ADV_LLD.1, provides the reader with the details of the TOE's design and describes at a module level how the design of the TOE addresses the SFRs. This level of description provides the detail of how modules interact within the TOE and if a flaw exists in the TOE's design, it is more likely to be found here rather than the high-level design. This requirement also mandates that the interfaces presented by modules be specified. Having knowledge of the parameters a module accepts, the errors that can be returned and a description of how the module works to support the security policies allows the design to be understood at its lowest level.

ADV_RCR.1 is used to ensure that the levels of decomposition of the TOE's design are consistent with one another. This is important, since design decisions that are analyzed and made at one level (e.g., functional specification) that are not correctly designed at a lower level may lead to a design flaw. This requirement helps in the design analysis to ensure design decisions are realized at all levels of the design. |
| O.SOUND_IMPLEMENTATION

The implementation of the TOE will be an accurate instantiation of its design, and is adequately and accurately documented. | ADV_IMP.2

ADV_LLD.1

ADV_RCR.1

ADV_INT.1

ALC_TAT.1 | While ADV_LLD.1 is used to aide in ensuring that the TOE's design is sound, it also contributes to ensuring the implementation is correctly realized from the design. It is expected that evaluators will use the low-level design as an aide in understanding the implementation representation. The low-level design requirements ensure the evaluators have enough information to intelligently analyze (e.g., the documented interface descriptions of the modules match the entry points in the module, error codes returned by the functions in the module are consistent with those identified in the documentation) the implementation and ensure it is consistent with the design.

While evaluators have the ability to "negotiate" the subset in ADV_IMP.1, ADV_IMP.2 was chosen to ensure evaluators have full access to the source code. If the evaluators are limited in their ability to analyze source code they may not be able to determine the accuracy of the implementation or the adequacy of the documentation. Often times it is difficult for an evaluator to identify the complete sample of code they wish to analyze. Often times looking at code in one subsystem may lead the evaluator to discover code they should look at in another subsystem. Rather than require the evaluator to "re-negotiate" another sample of code, the complete implementation representation is required.

When performing the activities associated with the ADV_INT.1 requirement, the evaluators will ensure that the architecture of the implementation is modular and consistent with the architecture presented in the low-level design. Having a modular implementation provides the evaluators with the ability to more easily assess the accuracy of the implementation, with respect to the design. If the implementation is overly complex (e.g., circular dependencies, not well understood coupling, reliance on side-effects) the evaluator may not have the ability to assess the accuracy of the implementation.

ALC_TAT.1 provides evaluators with information necessary to understand the implementation representation and what the resulting implementation will consist of. Critical areas (e.g., the use of libraries, what definitions are used, compiler options) are documented so the evaluator can determine how the implementation representation is to be analyzed.

ADV_RCR.1 is used here to provide the correspondence of the lowest level of decomposition (e.g., source code) to the adjoining level, low-level design. The correspondence analysis is used by |

Objective	Requirements Addressing the Objective	Rationale
		the evaluator as a tool when determining if the low-level design is correctly reflected in the implementation representation.
O.TIME_STAMPS The TOE shall provide reliable time stamps and the capability for the administrator to set the time used for these time stamps.	FPT_STM.1 FMT_MTD.1(3)	FPT_STM.1 requires that the TOE be able to provide reliable time stamps for its own use and therefore, partially satisfies this objective. Time stamps include date and time and are reliable in that they are always available to the TOE, and the clock must be monotonically increasing. FMT_MTD.1(3) satisfies the rest of this objective by providing the capability to set the time used for generating time stamps to either the Security Administrator, trusted IT entity, or both. The authorized IT entity was included as an option for the possible use of an NTP server to set the TOE's time.
O.DISTRIBUTED_DIRECTORY_SUPPORT The TSF shall be able to replicate definable subtrees to (produce) and accept replications of definable subtrees from (consume) other directories. The TSF shall be to authenticate using 3rd party introduction and 3rd party presentation for chaining.	FDD_RPL_EXP.1 FIA_UAU.5 FPT_SEP.2-NIAP-0424 FTP_ITC.1(1&2)	FDD_RPL_EXP.1 is the primary requirement concerning replication. This requirement specifies that the directory administrator controls the subtree and peer directory involved in the replication action. It also specifies that the security attributes be associated with the replicated information so that the security policy can be preserved. The requirement calls for the TOE to be able to act in both the producer role as well as the consumer role. FIA_UAU.5 requires the TSF be able to authenticate a relying party using 3rd party presentation or introduction from a peer trusted directory. When it's the introducer or presenter, the TSF provides a domain that protects itself from untrusted users, and requires a trusted channel for communication with a peer trusted directory to ensure the integrity and confidentiality of the user authentication data.
O.ROBUST_TOE_ACCESS The TOE will provide mechanisms that control a user's logical access to the TOE and to explicitly deny access to specific users when appropriate	FTA_TSE.1 FIA_UID.2 FTA_SSL.1 FTA_SSL.2 FTA_SSL.3(1) FTA_SSL.3(2) AVA_SOF.1 FIA_AFL.1-NIAP-0425 FIA_ATD.1(1) FIA_ATD.1(2) FIA_ATD.1(3) FIA_UAU.1 FIA_UAU.2 FIA_UAU.5 FPT_ITA.1 FPT_TDC.1(1) FPT_TDC.1(2)	FIA_UID.2 plays a small role in satisfying this objective by ensuring that every user is identified before the TOE performs any mediated functions. In some cases, the identification cannot be authenticated (e.g., anonymous access by a relying party, in which case the identity is presumed to be authentic). In other cases (e.g., directory administrator, authenticated relying parties), the identity of the user is authenticated. It is impractical to require authentication of all relying parties, therefore the requirements specified require authentication where it is deemed necessary. This does impose some risk that actions taken by an anonymous relying party may not be traceable to a human user. FIA_ATD.1 is iterated several times to ensure that the attributes of the different users of the TOE are specified correctly. This requirement is needed because it is here that the attributes that will be used by the TOE in making access control decisions are specified. FIA_UAU.1 contributes to this objective by limiting the services and directory objects that are provided by the TOE to unauthenticated users. FIA_UAU.2 specifies that all other users of the TOE not covered by FIA_UAU.1 have to authenticate, controlling their access to the TOE such that they cannot perform actions until after authentication is successful. The PP requires multiple authentication mechanisms to be available. FIA_UAU.5 requires that these mechanisms be used for the appropriate set of users defined by FIA_ATD.1(*), and also defines the rules for when they are used. It also defines the "third-party authentication" that takes place when a request is chained to the TOE, which is another way that users have of logically accessing the TOE.

Objective	Requirements Addressing the Objective	Rationale
		Local authentication is required to ensure someone that has physical access to the TOE and has not been granted logical access (e.g., a janitor) cannot gain unauthorized logical access to the TOE.
		The AVA_SOF.1 requirement is applied to the local authentication mechanism. For this TOE, the strength of function specified is medium. This requirement ensures the developer has performed an analysis of the authentication mechanism to ensure the probability of guessing a user's authentication data would require a high-attack potential, as defined in Annex B of the CEM.
		FTA_TSE.1 contributes to this objective by limiting a user's ability to logically access the TOE. This requirement provides the ability to control when (e.g., time and day(s) of the week) and where (e.g., from a specific network address) TOE users can access the TOE.
		FIA_AFL.1-NIAP-0425 provides a detection mechanism for unsuccessful authentication attempts. This requirement focuses on preventing inappropriate access to the TOE by guessing authentication information, which is why the requirements are worded to cover remote authentication requests. Since relying parties are untrusted with respect to the TOE, all of their authentication attempts are subject to investigation.
		The FTA_SSL family partially satisfies the O.ROBUST_TOE_ACCESS objective by ensuring that user's sessions are afforded some level of protection. FTA_SSL.1 provides the Platform Administrator the capability to specify a time interval of inactivity in which an unattended local administrative session would be locked and will require the administrator responsible for that session to re-authenticate before the session can be used to access TOE resources. FTA_SSL.2 provides administrators the ability to lock their local administrative session. This component allows administrators to protect their session immediately, rather than waiting for the time-out period and minimizes their session's risk of exposure. FTA_SSL.3 takes into account remote sessions. After an administrator-defined time interval of inactivity remote sessions will be terminated; this includes relying party sessions and remote administrative sessions (both directory sessions and platform sessions). This component is especially necessary, since remote sessions are not typically afforded the same physical protections that local sessions are provided.
		FPT_ITA.1 specifies the ability to control access to TSF data in a manner that makes certificates and revocation lists available for authentication decisions in a timely fashion.
		The two iterations of FPT_TDC are used to specify capabilities of the TOE that are needed when a user is accessing a TOE. FPT_TDC.1(1) is needed in order to interpret timestamps on certificates so that a determination can be made about whether they have expired. FPT_TDC.1(2) is needed so that distinguished names can be interpreted when they are presented to the TOE, and access granted if appropriate.
O.NONREPUDIATION At the option of an administrator, the TSF must be able to provide non-repudiation services for transmitted and received DIB data. These services must include both the generation and verification of evidence for non-repudiation, including a timestamp, and	FDD_DAU_EXP.1 FCO_NRO_EXP.1 FCO_NRR_EXP.1	FDD_DAU_EXP.1 implements the first part of the policy by requiring a cryptographic operation on the entries and attributes of the directory to generate a piece of evidence. This operation will ensure that the evidence can be used by any user of the directory to verify the validity of the directory entity or attribute that it is associated with; that is, that there have been no changes to the directory entity by a someone that is considered "not valid" or "unauthorized" Further the TOE has to maintain a list of the

Objective	Requirements Addressing the Objective	Rationale
notification that the evidence of receipt the TOE is waiting for is overdue. At the option of an administrator, the TSF must also be able to keep a 'verifiable journal of updates' for any entry or attribute in the directory, and provide evidence that the entry or attribute is valid.		"unauthorized". Further, the TOE has to maintain a list of the evidence in the case that there are multiple changes to the directory entity. The optional nature of the objective is captured in the requirement by the use of the term "shall be capable of". The second portion of the objective is met by two explicit requirements based on the FCO class. FCO_NRO.1 calls for the TSF to generate the evidence of origin at the request of either the sender or the receiver. This evidence has to be available for verification for an indefinite period of time to allow the interested parties a chance to review the information. Likewise, FCO_NRR.1 calls for the TSF to generate the evidence of receipt at the request of the sender or receiver. Both the evidence of origin and evidence of receipt have to be calculated over all fields in the transaction, providing the non-repudiation characteristics called for by this objective.
O.TRUSTED_PATH The TOE will provide a means to ensure users are not communicating with some other entity pretending to be the TOE, and that the TOE is communicating with an authorized IT entity and not some other entity pretending to be an authorized IT entity.	FTP_ITC.1(1) FTP_ITC.1(2) FTP_TRP.1(1) FTP_TRP.1(2)	FTP_TRP.1.1 requires the TOE to provide a mechanism that creates a distinct communication path that protects the data that traverses this path from disclosure (first iteration) or modification (second iteration). This requirement ensures that the TOE can identify the end points and ensures that a user cannot insert themselves between the user and the TOE, by requiring that the means used for invoking the communication path cannot be intercepted and allow a "man-in-the-middle-attack" (this does not prevent someone from capturing the traffic and replaying it at a later time – see FPT_RPL.1). Since the user invokes the trusted path (FTP_TRP.1.2) mechanism they can be assured they are communicating with the TOE. FTP_TRP.1.3 mandates that the trusted path be the only means available for providing identification and authentication information, therefore ensuring a user's authentication data will not be compromised when performing authentication functions. Furthermore, the remote administrator's communication path is encrypted during the entire session. FTP_ITC.1(1) and FTP_ITC.1(2) are similar to FTP_TRP.1(1) and FTP_TRP.1(2), in that they require a mechanism that creates a distinct communication path with the same characteristics, however FTP_ITC.1(1) and FTP_ITC.1(2) is used to protect communications between IT entities, rather than between a human user and an IT entity. FTP_ITC.1.3 requires the TOE to initiate the trusted channel, which ensures that the TOE has established a communication path with an authorized IT entity and not some other entity pretending to be an authorized IT entity.
O.VULNERABILITY_ANALYSIS_TEST The TOE will undergo appropriate independent vulnerability analysis and penetration testing to demonstrate the design and implementation of the TOE does not allow attackers with medium attack potential to violate the TOE's security policies.	AVA_VLA.3	To maintain consistency with the overall assurance goals of this TOE, O.VULNERABILITY_ANALYSIS_TEST requires the AVA_VLA.3 component to provide the necessary level of confidence that vulnerabilities do not exist in the TOE that could cause the security policies to be violated. AVA_VLA.3 requires the developer to perform a systematic search for potential vulnerabilities in all the TOE deliverables. For those vulnerabilities that are not eliminated, a rationale must be provided that describes why these vulnerabilities cannot be exploited by a threat agent with a moderate attack potential, which is in keeping with the desired assurance level of this TOE. As with the functional testing, a key element in this component is that an independent assessment of the completeness of the developer's analysis is made, and more importantly, an independent vulnerability analysis coupled with testing of the TOE is performed. This component provides the confidence that security flaws do not exist in the TOE that could be exploited by a threat

Objective	Requirements Addressing the Objective	Rationale
		agent of moderate (or lower) attack potential to violate the TOE's security policies.

6.4 RATIONALE FOR DEPENDENCIES

Each functional requirement, including explicit requirements was analyzed to determine that all dependencies were satisfied. All requirements were then analyzed to determine that no additional dependencies were introduced as a result of completing each operation. Table 6.3 identifies the functional requirement, and its correspondent dependency, Table 6.4 provides the analysis and rationale for dependencies not required in this PP.

Table 6.3 – Dependencies Table

ID	Component	Dependency	Satisfied
1	FAU_ARP.1	FAU_SAA.1	5
2	FAU_ARP_ACK_EXP.1	FAU_ARP.1	1
3	FAU_GEN.1-NIAP-0410	FPT_STM.1	55
4	FAU_GEN.2-NIAP-0410	FAU_GEN.1	3
		FIA_UID.1	36 (Hierarchical)
5	FAU_SAA.1-NIAP-0407	FAU_GEN.1	3
6	FAU_SAR.1(1)	FAU_GEN.1	3
7	FAU_SAR.1(2)	FAU_GEN.1	3
8	FAU_SAR.2	FAU_SAR.1	6, 7
9	FAU_SAR.3	FAU_SAR.1	6, 7
10	FAU_SEL.1-NIAP-0407	FAU_GEN.1	3
		FMT_MTD.1	41
11	FAU_STG.1-NIAP-0429	FAU_GEN.1	3
12	FAU_STG.3	FAU_STG.1	11
13	FAU_STG.NIAP-0429-1	FAU_STG.1	11
		FMT_MTD.1	41
14	FCO_NRO_EXP.1	FIA_UID.1	36 (Hierarchical)
15	FCO_NRR_EXP.1	FIA_UID.1	36 (Hierarchical)
16	FCS_BCM_EXP.1	None	N/A
17	FCS_CKM.1	FCS_CKM.2 or FCS_COP1	18

ID	Component	Dependency	Satisfied
		FCS_CKM.4	19
		FMT_MSA.2	N/A – See Table 6.4 below.
18	FCS_CKM_EXP.2	FCS_CKM.4	19
19	FCS_CKM.4	FDP_ITC.1 or FCS_CKM.1	17
		FMT_MSA.2	N/A – See Table 6.4 below.
20	FCS_COP_EXP.2	FCS_BCM_EXP.1	16
		FCS_CKM.1	17
		FCS_CKM_EXP.2	18
		FCS_CKM.4	19
21	FCS_COP_EXP.3	FCS_BCM_EXP.1	16
		FCS_CKM.1	17
		FCS_CKM_EXP.2	18
		FCS_CKM.4	19
22	FCS_COP_EXP.5	FCS_BCM_EXP.1	16
23	FCS_COP_EXP.6	FCS_BCM_EXP.1	16
24	FDP_ACC.2	FDP_ACF.1	25
25	FDP_ACF.1	FDP_ACC.1	24
		FMT_MSA.3	N/A – See Table 6.4 below.
26	FDD_DAU_EXP.1	FCS_COP.1	21, 23
		FPT_STM.1	55
27	FDD_RPL_EXP.1	None	N/A
28	FDP_RIP.2	None	N/A
29	FIA_AFL.1-NIAP-0425	FIA_UAU.1	33

ID	Component	Dependency	Satisfied
30	FIA_ATD.1(1)	None	N/A
31	FIA_ATD.1(2)	None	N/A
32	FIA_ATD.1(3)	None	N/A
33	FIA_UAU.1	FIA_UID.1	36 (Hierarchical)
34	FIA_UAU.2	FIA_UID.1	36 (Hierarchical)
35	FIA_UAU.5	No Dependencies	N/A
36	FIA_UID.2	No Dependencies	N/A
37	FIA_USB.1-NIAP-0351	FIA_ATD.1	30, 31, 32
38	FMT_MOF.1(1)	FMT_SMR.1	49 (Hierarchical)
		FMT_SMF.1	N/A – See Table 6.4 below.
39	FMT_MOF.1(2)	FMT_SMR.1	49 (Hierarchical)
		FMT_SMF.1	N/A – See Table 6.4 below.
40	FMT_MSA.1	[FDP_ACC.1 or FDP_IFC.1]	24
		FMT_SMR.1	49 (Hierarchical)
		FMT_SMF.1	N/A – See Table 6.4 below.
41	FMT_MTD.1(1)	FMT_SMR.1	49 (Hierarchical)
		FMT_SMF.1	N/A – See Table 6.4 below.
42	FMT_MTD.1(2)	FMT_SMR.1	49 (Hierarchical)
		FMT_SMF.1	N/A – See Table 6.4 below.
43	FMT_MTD.1(3)	FMT_SMR.1	49 (Hierarchical)
		FMT_SMF.1	N/A – See Table 6.4 below.
44	FMT_MTD.1(4)	FMT_SMR.1	49 (Hierarchical)

ID	Component	Dependency	Satisfied
		FMT_SMF.1	N/A – See Table 6.4 below.
45	FMT_MTD.2(1)	FMT_MTD.1	41
		FMT_SMR.1	49 (Hierarchical)
46	FMT_MTD.2(2)	FMT_MTD.1	41
		FMT_SMR.1	49 (Hierarchical)
47	FMT_SMF.1	None	N/A
48	FMT_SMR.2(1)	FIA_UID.1	36 (Hierarchical)
49	FMT_SMR.2(2)	FIA_UID.1	36 (Hierarchical)
50	FPT_ITA.1	None	N/A
51	FPT_RCV.2-NIAP-0406	FPT_TST.1	58, 59
		AGD_ADM.1	EAL
		ADV_SPM.1	EAL
52	FPT_RPL.1	None	N/A
53	FPT_RVM.1	None	N/A
54	FPT_SEP.2-NIAP-0424	None	N/A
55	FPT_STM.1	None	N/A
56	FPT_TDC.1(1)	None	N/A
57	FPT_TDC.1(2)	None	N/A
58	FPT_TST_EXP.4	FCS_COP.1	21, 23
59	FPT_TST_EXP.5	FCS_COP.1	21, 23
60	FRU_RSA.1(1)	None	N/A
61	FRU_RSA.1(2)	None	N/A
62	FTA_SSL.1	FIA_UAU.1	33
63	FTA_SSL.2	FIA_UAU.1	33
64	FTA_SSL.3(1)	None	N/A

ID	Component	Dependency	Satisfied
65	FTA_SSL.3(2)	None	N/A
66	FTA_TAB.1	None	N/A
67	FTA_TSE.1	None	N/A
68	FTP_ITC.1(1)	None	N/A
69	FTP_ITC.1(2)	None	N/A
70	FTP_TRP.1(1)	None	N/A
71	FTP_TRP.1(2)	None	N/A

Table 6.4 – Unsupported Dependency Rationale

Requirement	Dependency	Dependency Analysis and Rationale
FCS_CKM.1 FCS_CKM.4	FMT_MSA.2	This dependency is not applicable for this TOE since it's redundant to the requirements specified in the FCS components.
FDP_ACF.1	FMT_MSA.3	This dependency is not applicable for this TOE since restrictive default values for the SFP is already required in FDP_ACF.1, and this PP does not want to allow the default to be changed.
FMT_MOF.1(*) FMT_MSA.1 FMT_MTD.1(*)	FMT_SMF.1	This dependency is not applicable for this TOE since all the management functions required by the TOE are implicit in the other FMT components. FMT_SMF.1 is only used to specify the backup, recovery and archive requirements.

6.5   RATIONALE FOR EXPLICIT REQUIREMENTS

Table 6.5 presents the rationale for the inclusion of the explicit requirements found in this PP.

Table 6.5 – Rationale for Explicit Requirements

Explicit Requirement	Identifier	Rationale
FAU_ARP_ACK_DIR_EXP.1	Security alarm acknowledgement for Directory	This explicit requirement is necessary since a CC requirement does not exist to ensure an administrator will be aware of the alarm. The intent is to ensure that if an administrator is logged in and not physically at the console or remote workstation the message will remain displayed until the administrators have acknowledged it. The message will not be scrolled off the screen due to other activity-taking place (e.g., the auditor is running an audit report). The following are the dependencies for this component: FAU_ARP.1.
FAU_STG.NIAP-0429	Site-Configurable Prevention of Audit Loss	This explicit requirement is taken from the NIAP interpretation (originally I-0414 and subsequently modified by I-0429) to require functionality that is not available with current CC requirements. The authors of this PP want to provide the Security Administrator with the option of what action to take when the audit trail is full. The following are the dependencies for this component: FAU_STG.1, FMT_MTD.1.
FCO_NRO_EXP.1	Selective proof of origin for directory data	This explicit requirement is necessary since the existing CC non-repudiation components do not include requirements necessary to support the element of P.Non-repudiation that requires the TSF to provide notification that evidence of receipt the TOE is waiting for is overdue. This explicit requirement ensures the TSF, when it's a sender, will provide notification to the administrator when notification of receipt is overdue. The following are the dependencies for this component: FIA_UID.1, FPT_STM.1

Explicit Requirement	Identifier	Rationale
FCO_NRR_EXP.1	Selective proof of receipt for directory data	This explicit requirement is necessary since the existing CC non-repudiation components do not include requirements necessary to support the element of P.Non-repudiation that requires the TSF to provide notification that evidence of receipt the TOE is waiting for is overdue. This explicit requirement ensures the TSF, when it's a recipient, will provide notification to the sender that it received directory data. The following are the dependencies for this component: FIA_UID.1.
FCS_BCM_EXP.1	Baseline cryptographic module	This explicit requirement is necessary since the CC does not provide a means to specify a cryptographic baseline of implementation. The following are the dependencies for this component: none.
FCS_CKM_EXP.2	Cryptographic key establishment	This explicit requirement is necessary since the CC does not specifically provide components for key establishment. The following are the dependencies for this component: FCS_CKM.4
FCS_COP_EXP.2	Cryptographic Operation (Encryption/Decryption using AES)	This explicit requirement is necessary since the CC cryptographic operation components are focused on specific algorithm types and operations requiring specific key sizes, and does not include operating modes or the distinction between a cryptomodule and the TSF. The following are the dependencies for this component: FCS_BCM_EXP.1, FCS_CKM.1, FCS_CKM_EXP.2, FCS_CKM.4

Explicit Requirement	Identifier	Rationale
FCS_COP_EXP.3	Cryptographic Operation (Digital Signature Generation/Verification)	This explicit requirement is necessary since the CC cryptographic operation components are focused on specific algorithm types and operations requiring specific key sizes, and does not include parameters for the specific algorithms, or the distinction between a cryptomodule and the TSF. The following are the dependencies for this component: FCS_BCM_EXP.1, FCS_CKM.1, FCS_CKM_EXP.2, FCS_CKM.4
FCS_COP_EXP.5	Cryptographic Operation (Random Number Generation)	This explicit requirement is necessary since the CC cryptographic operation components are focused on specific algorithm types and operations requiring specific key sizes. The following are the dependencies for this component: FCS_BCM_EXP.1
FCS_COP_EXP.6	Cryptographic Operation (Cryptographic Hashing Function)	This explicit requirement is necessary since the CC cryptographic operation components are focused on specific algorithm types and operations requiring specific key sizes. The following are the dependencies for this component: FCS_BCM_EXP.1
FDD_DAU_EXP.1	Verifiable Journal of Updates	This explicit component is necessary to specify a unique requirement for a technology specific security service that is not addressed by the CC. This service is required for O.NONREPUDIATION. The following are the dependencies for this component: FCS_COP.1, FPT_STM.1.
FDD_RPL_EXP.1	Replication of directory data with security attributes.	This explicit component is necessary to specify a unique requirement for a technology specific security service that is not addressed by the CC. This service is required to meet O.REPLICATION. The following are the dependencies for this component: None.

Explicit Requirement	Identifier	Rationale
FPT_TST_EXP.4	TSF testing	This explicit component is necessary to specify the self-testing functionality required for medium robustness. The following are the dependencies for this component: FCS_COP.1.
FPT_TST_EXP.5	Cryptographic testing	This explicit component is necessary to specify the self-testing cryptography functionality required for medium robustness. The following are the dependencies for this component: FCS_COP.1
AVA_CCA_EXP.2	Systematic Cryptographic Module Covert Channel Analysis	This explicit requirement is necessary since the CC does not have requirements to perform a covert channel analysis on information that does not have an information flow control policy. This requirement ensures that the bandwidth of critical security parameters (e.g., keys) associated with the cryptographic module is documented.

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7 ACRONYMS

Table 7.1 – List of Acronyms

ACIA	Access Control Inner Administrative Area
ACIP	Access Control Inner Point
ACI	Access Control Information
ACL	Access Control List
ACSA	Access Control Specific Area
ACSP	Access Control Specific Point
ADS	Authoritative Data Source
ADUA	Administrative Directory User Agent
AM	Assurance Maintenance
ANSI	American National Standards Institute
ARL	Authority Revocation List
C/S/A	CINC/Service/Agency
CA	Certificate Authority
CC	Common Criteria
CIMC	Certificate Issuing and Management Component
CINC	Commander-in-Chief
CM	Configuration Management
CMA	Certificate Management Authority
DA	Directory Administrator
DACD	Directory Access Control Domains
DAP	Directory Access Protocol
DES	Data Encryption Standard
DIB	Directory Information Base
DISA	Defense Information Services Agency
DIT	Directory Information Tree
DN	Distinguished Name
DoD	Department of Defense
DSA	Directory Service Agent
DSP	Directory System Protocol
DUA	Directory User Agent

EAL	Evaluation Assurance Level
EDI_PI	Electronic Data Interchange Personnel Identifier
FIPS	Federal Information Processing Standard
FOUO	For Official Use Only
FTP	File Transfer Protocol
GDS	Global Directory Service
GIG	Global Information Grid
HAG	High Assurance Guard
HTTP	Hypertext Transport Protocol
I&A	Identification and Authentication
ICMP	Internet Control Message Protocol
ID	Identification
IP	Internet Protocol
IT	Information Technology
KEA	Key Exchange Algorithm
KM	KMI Manager
KMI	Key Management Infrastructure
KR	Key Recovery
LAN	Local Area Network
LDAP	Lightweight Directory Access Protocol
MD	Misuse Detection System
NIAP	National Information Assurance Partnership
NIC	Network Interface Card
NIPRNet	Non-classified Internet Protocol Router Network
NIST	National Institute of Standards and Tests
NSA	National Security Agency
NTP	Network Time Protocol
PKCS	Public Key Cryptography Standard
PKI	Public Key Infrastructure
PP	Protection Profile
PRSN	Primary Services Node
PSN	Product Source Node
PUB	Publication

RFC	Request for Comments
RL	Revocation List
RM	User Registration Manager
SA	System Administrator
SASL	Simple Authentication and Security Layer
SFP	Security Function Policy
SIPRNet	Secret Internet Protocol Router Network
SOF	Strength of Function
SMTP	Simple Message Transfer Protocol
SSL	Secure Socket Layer
SSO	System Security Officer
ST	Security Target
TCP	Transmission Control Protocol
TLS	Transport Layer Security
TOE	Target of Evaluation
TP	Trusted Path
TSC	TSF Scope of Control
TSF	TOE Security Functions
TSFI	TSF Interface
TSP	TOE Security Policy
UDP	User Datagram Protocol
UTC	Coordinated Universal Time
VPN	Virtual Private Network

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8 REFERENCES

8.1 DIRECTORY REFERENCES

1) Basic and Simplified Access Control in LDAP *<draft-legg-ldap-acm-bac-01.txt>*, Legg, S; September 2002.

2) Chadwick, David W., *Understanding X.500 – The Directory*, 1994.

3) Cheresh, Beth and Doug Cheresh, *Understanding Directory Services*, New Riders Publishing, 2000.

4) *Common Criteria for Information Technology Security Evaluation*, Version 2.1, CCIMB-99-031 (ISO/IEC 15408:1999), August 1999

5) Descriptions of SHA-256, SHA-384, and SHA-512

6) *Digital Signatures using Reversible Public Key (rDSA),* ANSI X9.31-1998

7) *Guide for the Production of Protection Profiles and Security Targets*, 2001-01-04, ISO/IEC PDTR 15446.

8) Housley and Polk, *Internet X.509 Public Key Infrastructure: Representation of Key Exchange Algorithm (KEA) Keys in Internet X.509 Public Key Infrastructure Certificates*, March 1999. (www.ietf.org/rfc/rfc2528.txt)

9) Housley, Ford, Polk, and Solo, *Internet X.509 Public Key Infrastructure: Certificate and CRL Profile,* January 1999. (www.ietf.org/rfc/2459.txt)

10) Howes, Timothy, Mark Smith, and Gordon Good, *Understanding and Deploying LDAP Directory Services*, New Riders Publishing, 1999.

11) International Standard ISO 10181-3 *Access Control Framework*

12) ITU-T Recommendation X.501 (1997): Information Technology - Open Systems Interconnection – The Directory: Models, 1997.

13) ITU-T Recommendation X.509 (1997 E): Information Technology - Open Systems Interconnection – The Directory: Authentication Framework, 1997.

14) ITU-T Recommendation X.511 (1997): Information Technology - Open Systems Interconnection – The Directory: Abstract Services Definition, 1997.

15) ITU-T Recommendation X.521 (1997): Information Technology - Open Systems Interconnection – The Directory: Selected Object Classes, 1997.

16) *Key Agreement and Key Transport Using Elliptic Curve Cryptography*, X9.63

17) Krawczy, Bellar, and Canett, *HMAC: Keyed-Hashing for Message Authentication*, February 1997.

18) National Institute of Standards and Technology, *Computer Data Authentication*, Federal Information Processing Standards Publication 113, 30 May 1985.

19) National Institute of Standards and Technology, *Data Encryption Standard*, Federal Information Processing Standards Publication 46-3, 25 October 1999.

20) National Institute of Standards and Technology, *DES Modes of Operation*, Federal Information Processing Standards Publication 81, 2 December 1980.

21) National Institute of Standards and Technology, Digital Signature Standard (DSS), Federal Information Processing Standards Publication 186-2, 27 January 2000.

22) National Institute of Standards and Technology, *Secure Hash Standard*, Federal Information Processing Standards Publication 180-1, 17 April 1995.

23) National Institute of Standards and Technology, *Security Requirements for Cryptographic Modules*, Federal Information Processing Standards Publication 140-2, 25 May 2001.

24) National Security Agency, Strong Authentication for X.500, Revision B, 12 May 1999.

25) National Security Agency, X.509 Certificate and Certificate Revocation List Profiles and Certification Path Processing Rules for MISSI, Revision D, 12 May 1999.

26) *Public Key Cryptography for the Financial Services Industry: Agreement of Symmetric Keys Using Discrete Logarithm Cryptography*, X9.42-2001.

27) RSA Cryptography Standard, RSA Laboratories, PKCS #1, v2.0 1 October 1998

28) Signed Directory Operations using S/MIME   *<Draft_ietf_ldapext_sigops_03.txt>,* Greenblatt, Bruce and Richard, Pat; July 1998.

29) Skipjack and KEA Algorithm Specifications, Version 2.0, 29 May 1998.

30) *The Elliptic Curve Digital Signature Algorithm,* ANSI X9.62-1998

31) *Triple DES Encryption Algorithm Modes of Operation,* ANSI X9.52-1998

8.2   REQUIREMENTS REFERENCES

1) *Department of Defense Key Management Infrastructure / Public Key Infrastructure Capability Increment 1 Overview*, Version 2.0, 25 May 2000.

2) *Firewall Recommendation Report for the GDS Directory*, 8 December 2000

3) *GDS Baseline Requirements for JDSWG 4-20-011.xls*

4) GDS/KMI Interface Control Doc v.1, GDS KMI ICD v1.0.doc

5) *Global Directory Service Backup & Failover Plan*, 12 January 2001

6) *Global Directory Service Roadmap*, October 2000

7) *Global Directory Service System Architecture Version1.0*, 26 February 2001

8) *Key Management Infrastructure (KMI): Capability Increment 1: System Interface Description*, 13 April 2000.

9) *KMI CI-1 CONOPS, Directory Section*, 30 June 2000.

10) *KMI Directory Schema*, (CI-1 Final), Version 2.1, 5 March 2001.

11) *KMI-DISA Global Directory Service: Service Level Agreement*, V0.3, 17 November 2000.

12) *KMI Security Architecture for Capability Increment 1 (CI-1)*, version 1, 1 December 2000.

13) KMI Security Policy and Requirements, 6 September 2000.

14) *KMI Security Policy for Capability Increment 1 (CI-1)*, Version 0.2, 22 September 2000.

15) *NSA Security Guidance for DoD Class 4 PKI Directory Service (DS)*, 15 June 2000.

16) *Operational Requirements for the Defense Message System Directory Services*, Allied Communications Protocol (ACP) 120, Version 1.0, 17 December 1999.

17) *Public Key Infrastructure Implementation Plan for the Department of Defense*, Version 3.1, 18 December 2000.

18) *Public Key Infrastructure Roadmap for the Department of Defense*, version 5.0, 18 December 2000.

19) *System Description for Capability Increment 1 (CI-1)*, Revision 2.2, 28 February 2001.

20) *System Requirements Specification (SRS) for Capability Increment 1 (CI-1)*, Revision 2.2, 28 February 2001.

21) *X.509 Certificate Policy for the US Department of Defense*, Version 5.2, 13 November 2000.

8.3 RELATED PROTECTION PROFILES

1) *A Goal VPN PP for Protecting Sensitive Information,* Validated version to be determined.

2) *Certificate Issuing and Management Components Family of Protection Profiles*, Draft Version 1.0, 31 October 2001.

3) *Department of Defense Public Key Infrastructure Target Token Protection Profile*, Validated version to be determined.

4) *Final U.S. Department of Defense Traffic-Filter Firewall Protection Profile for Medium Robustness*, Version 1.4, 1 May 2000.

5) *Intrusion Detection System Analyzer Protection Profile*, Validated version to be determined.

6) *Intrusion Detection System Protection Profile*, Validated version to be determined.

7) *Intrusion Detection System Scanner Protection Profile*, Validated version to be determined.

8) *Intrusion Detection System Sensor Protection Profile*, Validated version to be determined.

9) *Protection Profile for Single Level Operating Systems in Environments Requiring Medium Robustness*, Version 1.22, 23 May 2001.

10) *U.S. Department of Defense Application Firewall Protection Profile for Medium Robustness*, Version 1.0, dated 28 June 2000.

11) *U.S. Department of Defense Remote Access Protection Profile for High Assurance Environments*, Validated version to be determined.

12) *Web Browser Protection Profile*, Validated version to be determined.

13) *Web Server Protection Profile*, Validated version to be determined.

9 TERMINOLOGY

3rd Party Introduction — A form of authentication used in the chaining process when a TOE trusts that the peer trusted directory correctly verified the authentication credentials of the relying party before passing the chained request to the TOE.

3rd Party Presentation — A form of authentication used in the chaining process when a TOE trusts that the peer directory ensured the integrity and, if necessary, the confidentiality of the authentication credentials passed to the TOE as part of the chained request.

Access — Interaction between an entity and an object that results in the flow or modification of data.

Access Control — Security service that controls the use of resources[2] and the disclosure and modification of data.[3]

Access Control Information (ACI) — Information stored in the directory that is used to determine which users have been granted access to directory objects and what type of access has been granted (e.g., read, write).

Access Control Decision Function — A specialized function that makes access control decisions by applying access control policy rules to an access request.

Access Control Domain — DIB that includes a set of access control requirements for all data in that DIB.

Access Control Scheme — Access control scheme, from X.500, identifies the access control model and access control decision functions. Examples of access control schemes include X.500 Basic Access Control with role-base and X.500 Simple Access Control with role-based.

Accountability — Property that allows activities in an IT system to be traced to the entity responsible for the activity.

Administrative Directory User Agent (ADUA) — A specialized trusted user interface to perform administrative functions on the directory.

Administrator — A user who has been specifically granted the authority to manage the TOE or a subset of the TOE, and whose actions may affect the TSP. Administrators may possess special privileges that provide capabilities to override portions of the TSP.

Anonymous Relying Party — Anonymously authenticated relying party.

Application Note — Supporting information that is considered relevant or useful for the construction, evaluation, or use of the TOE.

Assurance — A measure of confidence that the security features of an IT system are sufficient to enforce its' security policy.

Asymmetric Cryptographic System — A system involving two related transformations; one determined by a public key (the public transformation), and another determined by a private key (the private transformation) with the property that it is computationally infeasible to determine the

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[2] Hardware and software.

[3] Stored or communicated.

private transformation (or the private key) from knowledge of the public transformation (and the public key).

Asymmetric Key — The corresponding public/private key pair needed to determine the behavior of the public/private transformations that comprise an asymmetric cryptographic system.

Attack — An intentional act attempting to violate the security policy of an IT system.

Attack Potential — The perceived potential for success of an attack, should an attack be launched, expressed in terms of an attacker's expertise, resources and motivation.

Attribute — A property that is associated with an entry. Attributes may be of a user type or operational type. User attributes are those attributes accessible by users. Operational attributes are attributes used by the directory and not accessible by users. An attribute is made up of attribute values and attribute type. The attribute type defines how the attribute value is used and processed. Attributes may be mandatory or optional.

Audit — To conduct an internal or independent review and assessment of records and/or activities.

Auditor — Role required by the TOE for a type of Administrative user that is given privileges commensurate with performing audit functions.

Authentication — Security measure that verifies a claimed identity.

Authentication Data — Information used to verify a claimed identity.

Authority Revocation List — See Revocation List.

Authorization — Permission, granted by an entity authorized to do so, to perform functions and access data.

Authorized User — An authenticated user who may, in accordance with the TSP, perform an operation.

Availability — Timely[4], reliable access to IT resources.

Basic Access Control — One of three X.500-defined access control schemes for the directory. It is defined in 1997 version of X.501.

Bind — The protocol used to connect to a directory.

Certification Authority (CA) — An entity authorized to issue, manage, and revoke certificates.

Certificate-based authentication (two-way) — Identification and authentication is bi-directional, both entities provide proof of identity before the authentication is considered complete.

Certificate Revocation List (CRL) — See Revocation List.

Chaining — Process used in a distributed directory environment in which a query for information is passed from one DSA to another. The results of the query are then returned to the originating DSA, which is then returned to the client. There are two authentication mechanisms used in the chaining process that ensure the access control policies can apply to these requests: "3rd party introduction" and "3rd party presentation".

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[4] According to a defined metric.

Common Criteria — The Common Criteria represents the outcome of a series of efforts to develop criteria for evaluation of IT security that are broadly useful within the international community.

Compromise — Violation of a security policy.

Confidentiality — A security policy pertaining to disclosure of data.

Connectivity — The property of the TOE that allows interaction with IT entities external to the TOE. This includes exchange of data by wire or by wireless means, over any distance in any environment or configuration.

Critical Security Parameters (CSP) — Security-related information (e.g., cryptographic keys, authentication data such as passwords and pins, and cryptographic seeds) appearing in plaintext or otherwise unprotected form and whose disclosure or modification can compromise the security of a cryptographic module or the security of the information protected by the module.

Cryptographic Administrator — An authorized user role that has been granted the authority to perform cryptographic initialization and management functions. These users are expected to use this authority only in the manner prescribed by the guidance given to them.

Cryptographic Algorithm — Asymmetric: A cryptographic algorithm that uses two related keys, a public key and a private key. The two keys have the property that, given the public key, it is computationally infeasible to derive the private key.

Cryptographic Algorithm — Symmetric: A cryptographic algorithm that uses a single, secret key for both encryption and decryption.

Cryptographic Boundary — An explicitly defined contiguous perimeter that establishes the physical bounds (for hardware) or logical bounds (for software) of a cryptographic module.

Cryptographic Key (key) — A parameter used in conjunction with a cryptographic algorithm that determines:

- the transformation of plaintext data into ciphertext data,
- the transformation of cipher text data into plaintext data,
- a digital signature computed from data,
- the verification of a digital signature computed from data, or
- a digital authentication code computed from data.

Cryptographic Module (cryptomodule) — The set of hardware, software, firmware, or some combination thereof that implements cryptographic logic or processes, including cryptographic algorithms, and is contained within the cryptographic boundary of the module.

Cryptographic Module Security Policy — A precise specification of the security rules under which a cryptographic module must operate, including the rules derived from the requirements of this PP and additional rules imposed by the vendor.

Data Manager — A role required by the TOE for trusted human users or external IT entities responsible for providing or accessing a set of trusted data (TSF data).

Defense-in-Depth (DID) — A security design strategy whereby layers of protection are utilized to establish an adequate security posture for an IT system.

Dependency — A relationship between requirements such that the requirement that is depended upon must normally be satisfied for the other requirements to be able to meet their objectives.

Digital Certificate — An element of a PKI that is used to bind a key to an entity. There are many types of digital certificates resulting from differing standards and operational environments. For the purposes of this PP, "digital certificate" should be generically.

Digital Signature — A non-forgeable transformation of data that allows proof of the source and verification of the integrity of that data.

Directory — A repository, centralized or distributed in nature, from which known system entities may obtain public key certificates, or other information.

Directory Access Control Domain (DACD) — The scope of an access control policy.

Directory Administrator (DA) — Role supported by the TOE that is given privileges commensurate with administering the TOE.

Directory Information Base (DIB) — The complete set of all the information held in the directory, i.e., the DIB entries and DIB attributes.

DIB Attribute — Each piece of information that describes some aspect of a DIB entry.

DIB Entry — Structures that hold the DIB information, including the objects and its attributes.

Directory Information Tree — Logical structure of information. Entries of the DIB are arranged in the form of a tree known as the Directory Information Tree (DIT) where the vertices represent the DIB Entries.

Directory System Agent (DSA) — Term describing the server component of a directory service. More technically, a DSA is a software process that is responsible for serving all requests (search, read, modify, etc.) to a defined naming context.

Directory User Agent (DUA) — Client application used to access the directory. More technically, a DUA is a software application that communicates with a DSA to issue requests (search, read, modify, etc.).

Discretionary Access Control (DAC) — A means of restricting access to objects based on the identity of subjects and/or groups to which they belong. These controls are discretionary in the sense that a subject with a certain access permission is capable of passing that permission (perhaps indirectly) on to any other subject.

Distributed Directory — A directory system that comprises multiple individual directory servers that interoperate to form an overall distributed directory that receives its data from various sources, protects it in accordance with the system security policy, and makes it available in accordance with the system security policy.

Distinguished Name — A representation of a directory name, defined as a construct that identifies a particular object from among the set of all objects.

Enclave — A collection of entities under the control of a single authority and having a homogeneous security policy. They may be logical, or may be based on physical location and proximity.

Encrypted Channel — A communications channel connecting the TOE to an outside IT entity that has been secured to prevent disclosure of information in the channel.

Entity — A subject, object, user or another IT device, which interacts with TOE objects, data, or resources.

Evaluation Assurance Level (EAL) — A package consisting of assurance components from Part 3 that represents a point on the CC predefined assurance scale.

External IT entity — Any trusted Information Technology (IT) product or system, outside of the TOE, which may, in accordance with the TSP, perform an operation.

Global Directory Service (GDS) — An integrated enterprise level directory service that facilitates sharing of information from various data sources.

Human User — Any person who interacts with the TOE.

Intrusion Detection System (IDS) — An example of a trusted external IT entity that identifies events that that may be indicative of an attack on a system. There are various types of IDS including network based IDS, platform based IDS, etc.

Internet Engineering Task Force (IETF) — Open international community concerned with the evolution of the Internet architecture technologies.

Identity — A representation (e.g. a string) uniquely identifying an authorized user, which can be either the full or abbreviated name of that user or a pseudonym.

Integrity — A security policy pertaining to the corruption of data and TSF mechanisms.

Journal of Entries — Term used to describe a multi-valued attribute that holds the list of changes associated with an entry in the DIB.

Key Management — The activities involving the handling of cryptographic keys and other related security parameters (e.g., IVs, passwords) during the entire life cycle of the keys, including their generation, storage, distribution, entry and use, deletion or destruction, and archiving.

Lightweight Directory Access Protocol (LDAP) — Internet protocol for accessing distributed directory services that act in accordance with X.500 data and service models.

Named Object[5] — An object that exhibits all of the following characteristics:

- The object may be used to transfer information between subjects of differing user identities within the TSF.
- Subjects in the TOE must be able to request a specific instance of the object.
- The name used to refer to a specific instance of the object must exist in a context that potentially allows subjects with different user identities to request the same instance of the object.
- (Note: Due to the deletion of the last sentence in the OS PP (pertaining to intended use of the object being for sharing user data), something may need to be done to the requirements section of the PP (i.e., FDP_ACF) to ensure that some objects, which may satisfy the above but which are not intended for sharing user data do not need a full DAC implementation but rather it is acceptable if they are "owner only" or some other appropriate mechanism).

Non-Repudiation — A security policy pertaining to providing one or more of the following:

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[5]The only named objects in this PP, are operating system controlled files.

- To the sender of data, proof of delivery to the intended recipient,

- To the recipient of data, proof of the identity of the user who sent the data.

Object — An entity within the TSC that contains or receives information and upon which subjects perform operations. Examples include a DIB entry, attribute, or object class.

Operating Environment — The total environment in which a TOE operates. It includes the physical facility and any physical, procedural, administrative and personnel controls.

Organizational Security Policies — One or more security rules, procedures, practices, or guidelines imposed by an organization upon its operations.

Package — A reusable set of either functional or assurance components (e.g. an EAL), combined together to satisfy a set of identified security objectives.

Password — A string of characters (letters, numbers, and other symbols) used to authenticate an identity or to verify access authorization.

Peer Trusted Directory — A trusted external IT entity that performs directory functions as part of a distributed directory system.

Peer TOEs — A Peer Trusted Directory that is also compliant to this PP.

Platform — Typically a device that includes the hardware and software elements that support all or part of the functional requirements of the TOE applications.

Precedence Levels — Predetermined levels of importance used in access control decisions.

Product — A package of IT software, firmware and/or hardware, providing functionality designed for use or incorporation within a multiplicity of systems.

Protected Items — Data in the TOE that is protected using access control mechanisms.

Protection Profile (PP) — An implementation-independent set of security requirements for a category of TOEs that meet specific consumer needs.

Public Key Infrastructure (PKI) — A mechanism that allows users to securely exchange data through the use of a public and a private cryptographic key pairs that are obtained and shared through a trusted authority.

Pull Operation — An operation in which data is taken as opposed to requested.

Referral — Process used in a distributed directory environment in which a query for information is returned to the client unanswered or partially answered, but with a list of recommended alternate directory servers for the client to query. It is then up to the client to query those additional servers.

Refinement — The addition of details to a component.

Relying Party — Untrusted users or untrusted external IT entities that rely on information in a directory and the integrity of that information in the directory.

Remote Trusted User — A trusted user or trusted external IT entity that accesses the directory from a location outside the boundary of the TOE.

Replay — An attack in which a third party captures a command in transmission and replays it at a later time.

Replica — All or a portion of a single DIB that is replicated into or out of a directory.

Replication — Process used in a distributed directory environment in which a replica is distributed to and/or from other directories.

Replication Supplier — A directory that serves as the source of a replica.

Replication Consumer — A directory server that serves as the recipient of the replica.

Revocation List — A document maintained and published by a certification authority (CA) that lists certificates issued by the CA that are no longer valid. There are many types of revocation lists including certificate revocation lists (CRL) authority revocation lists (ARL), etc.

Robustness — A characterization of the strength of a security function, mechanism, service or solution, and the assurance (or confidence) that it is implemented and functioning correctly. DoD has three levels of robustness:

> **Basic:** Security services and mechanisms that equate to good commercial practices. Basic robustness equates to EAL-2 plus; AMA (Maintenance of Assurance); and ALC_FLR (Flaw Remediation) as defined in CCIB-98-028, Part 3, Version 2.0

> **Medium:** Security services and mechanisms that provide for layering of additional safeguards above good commercial practices. Medium robustness equates to EAL-4 plus; AMA (Maintenance of Assurance); ALC_FLR (Flaw Remediation); ADV_IMP.2; ADV_INT.1; ATE_DPT.2; and AVA_VLA.3 Moderately Resistant, Vulnerability Analysis, as defined in CCIB-98-028, Part 3, Version 2.0

> **High:** Security services and mechanisms that provide the most stringent protection and rigorous security countermeasures.

Role — A predefined set of rules establishing the allowed interactions between a user and the TOE.

Secret — Information that must be known only to authorized users and/or the TSF in order to enforce a specific SFP.

Secure State — Condition in which all TOE security policies are enforced.

Security Administrator — Role supported by the TOE, which is a type of Administrative user that is given privileges commensurate with maintaining the security-related functionality of the TOE. Security Administrators may be responsible for security functions on both the platform and the directory.

Security attribute — TSF data associated with subjects, objects, and users that are used for the enforcement of the TSP.

Security Policy — A precise specification of the security rules under which the TOE shall operate, including the rules derived from the requirements of this document and additional rules imposed by the vendor.

Security Target (ST) — A set of security requirements and specifications to be used as the basis for evaluation of an identified TOE.

Selection — The specification of one or more items from a list in a component.

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SOF-basic — A level of the TOE strength of function where analysis shows that the function provides adequate protection against casual breach of TOE security by attackers possessing a low attack potential.

SOF-high — A level of the TOE strength of function where analysis shows that the function provides adequate protection against deliberately planned or organized breach of TOE security by attackers possessing a high attack potential.

SOF-medium — A level of the TOE strength of function where analysis shows that the function provides adequate protection against straightforward or intentional breach of TOE security by attackers possessing a moderate attack potential.

Strength of Function (SOF) — A qualification of a TOE security function expressing the minimum efforts assumed necessary to defeat its expected security behavior by directly attacking its underlying security mechanisms.

Subject — An entity within the TSC that causes operations to be performed. Subjects can come in two forms: trusted and untrusted. Trusted subjects are exempt from part or all of the TOE security policies. Untrusted subjects are bound by all TOE security policies.

Subtree — Grouped set of entries that are administered by the same administrator. Multiple subtrees may exist in a single DIB.

Symmetric key — A single, secret key used for both encryption and decryption in symmetric cryptographic algorithms.

System — A specific IT installation, with a particular purpose and operational environment.

Target of Evaluation (TOE) — An IT product or system and its associated administrator and user guidance documentation that is the subject of an evaluation.

Threat — Capabilities, intentions and attack methods of adversaries, or any circumstance or event, with the potential to violate the TOE security policy.

Threat Agent — Any human user or Information Technology (IT) product or system, which may attempt to violate the TSP and perform an unauthorized operation with the TOE.

Time stamp — Electronic seal including a time and/or date indication applied over data.

Time synchronization System — An example of a trusted external IT entity that the TOE relies on as a reliable time source.

TOE resource — Anything useable or consumable in the TOE.

TOE Security Functions (TSF) — A set consisting of all hardware, software, and firmware of the TOE that must be relied upon for the correct enforcement of the TSP.

TOE Security Functions Interface (TSFI) — A set of interfaces, whether interactive (man-machine interface) or programmatic (application programming interface), through which TOE resources are accessed, mediated by the TSF, or information is obtained from the TSF.

TOE Security Policy (TSP) — A set of rules that regulate how assets are managed, protected and distributed within a TOE.

Trusted — Used to describe any user or IT entity that is authenticated to the TOE with some level of assurance.

Trusted channel — A means by which a TSF and a remote trusted IT product can communicate with necessary confidence to support the TSP.

Trusted path — A means by which a user and a TSF can communicate with necessary confidence to support the TSP. A mechanism by which a trusted user can communicate directly and reliably with the directory and that can only be activated by the user and cannot be imitated by untrusted software.

TSF data — Data created by and for the TOE that might affect the operation of the TOE.

TSF Scope of Control (TSC) — The set of interactions that can occur with or within a TOE and are subject to the rules of the TSP.

Unit of Replication — The set of entries and attributes that are specified to be replicated, frequently denoted by the DN at the top of a subtree.

User — Any entity (human user or external IT entity) outside the TOE that interacts with the TOE.

User Class — A schema used for determining the rules to be applied to a relying party when deciding the users permissions to the requested protected item (access control decision). Users can be granted permissions based on their distinguished name, identity, subtree information, etc.

User Data — Data created by and for the user that does not affect the operation of the TSF.

User Group — Group that further identifies users in a system.

Vulnerability — A weakness that can be exploited to violate the TOE security policy.

X.500 — Set of ISO/ITU specifications defining a distributed directory service.